A Plan to Streamline DoD's Science and Technology, Engineering, and Test and Evaluation Infrastructure

Report of the Section 907 and
Section 912(c)
Senior Steering Group for
Review of the RDT&E Infrastructure

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Contents

Executive Summary

This plan outlines initiatives to streamline the Department of Defense (DoD) Science and Technology (S&T), Engineering, and Test and Evaluation (T&E) infrastructure, commonly referred to as the Research, Development, Test, and Evaluation (RDT&E) infrastructure. In April of 1998, the Secretary of Defense (SECDEF) reported to Congress pursuant to section 912(c) of the National Defense Authorization Act (NDAA) for Fiscal Year 1998 (Appendix A, page A-2), which required a review of the DoD's acquisition workforce. That report highlighted a number of areas requiring further study, including initiatives to streamline the RDT&E infrastructure, the subject of this follow-on report. Subsequent to the April 1998 report, section 907 of the Strom Thurmond NDAA for Fiscal Year 1999 (Appendix A, page A-5) required a similar study of the RDT&E infrastructure. Consequently, the section 907 initiatives have been incorporated into this report.

PERSPECTIVES ON RDT&E INFRASTRUCTURE

Base Realignment and Closure

The DoD's laboratory and T&E infrastructure have been the subject of nearly continuous scrutiny since the end of the Cold War era. The fundamental rationale for this scrutiny has been the belief that the RDT&E infrastructure, sized to respond to the Cold War threat, should be structured to reflect a shrinking defense budget and force structure, which are approximately 40 percent less today than they were ten years ago.

An early part of the RDT&E infrastructure review process occurred as part of the Defense Management Review (DMR) process in 1989. At that time, the Office of the Secretary of Defense (OSD) proposed an acquisition structure, to include RDT&E, independent from the assets of the Military Departments. The Services responded by planning and executing internal consolidations and efficiencies, and by creating a "Reliance" process for the S&T and T&E areas. The results of this process were codified in Defense Management Report Decision 922 (Appendix A, page A-7). Coincident with and subsequent to the DMR process, the Department conducted four Base Realignment and Closure (BRAC) rounds in 1988, 1991, 1993, and 1995, which led to the results summarized in Appendix A, page A-12.

The total savings attributable to BRAC closures have been well documented by the Department, but there is no separate data base that allows easy identification of those portions of the savings that are due to laboratory and T&E center organizational changes, closures, and realignments. However, there are well docu-

mented data from the Defense Manpower Data Center that indicate that staffing levels in the laboratories and T&E centers have declined from 131,000 at the end of FY1990 to 93,000 at the end of FY1997. At an average salary plus fringe benefits of approximately $62,000, this means that the costs of federal employees of the laboratories and T&E centers have declined by about $2.4 billion annually. There have been physical infrastructure reductions and other savings as well. Recognizing that personnel account for about 60% of in-house technical and support operations, it is estimated that such operations costs are presently about $3.9 billion less annually than in 1990. One must hasten to add, however, that many civil servants were replaced by "on-site" contractors conducting essentially the same functions and any cost savings estimate must be adjusted for such replacements.

Vision 21

As part of BRAC 95 deliberations, estimates of capacity were made for the laboratory and T&E infrastructure. These estimates suggested 35 percent excess capacity in the defense laboratories and 50 percent excess in some areas of the T&E infrastructure. Despite these findings, there were minimal reductions in the RDT&E infrastructure resulting from BRAC 95. Similarly, BRAC 95 was specifically focused on reducing cross-service redundancies and there were no significant actions here as well. Congress reacted to these results with passage of section 277 of the NDAA for FY 1996 (Appendix A, page A-15), which called for reduction to the minimum number of laboratories and T&E centers necessary to conduct the Department's RDT&E mission and directed attention to reductions cross-service in specific warfighting areas.

Activities that implemented section 277, code named Vision 21, were pursued by the Military Departments, Defense Agencies, and the Office of the Secretary of Defense (OSD) for approximately one year, from February 1996 to February 1997. At that time, actions were placed on hold as the department negotiated with Congress on renewed BRAC authority. When that authority was not forthcoming, Vision 21 was discontinued. Vision 21 did provide, however, the framework for the section 912(c) and 907 studies reported here. Among other things, it confirmed the lessons learned from BRAC 95: that is, that laboratories and T&E centers should be considered together, rather than separately as in BRAC 95; and that a Senior Steering Group incorporating representatives from the Military Services, Defense Agencies, and OSD must be established to direct the study and adjudicate cross-service issues. Vision 21 also established the definitions of laboratories and T&E centers (Appendix A, page A-17), the list of laboratories and T&E centers corresponding to that definition (Appendix A, page A-18), and the definition of "infrastructure" (Appendix A, page A-24), all of which were used for the section 912(c)/907 study reported here.

In April 1998, the Department issued a report on BRAC that provided updated estimates of excess capacity in RDT&E facilities, measured in square footage,

which range from 20% to 60%, depending on the Service and method of estimating.

STUDY METHODOLOGY

The mandate in the SECDEF's April 1998 report to Congress on section 912(c), requiring study of the RDT&E infrastructure, was delegated to the Under Secretary of Defense (Acquisition and Technology) [USD(A&T)] (Appendix A, page A-25). The USD (A&T) established a Senior Steering Group (SSG) composed of OSD and Military Service and Defense Agency representatives to provide advice on the SECDEF's requirements and to develop implementation plans for restructuring and revitalizing the laboratory, engineering, and T&E infrastructure. The SSG tasked each of the Services and appropriate Defense Agencies to develop aggressive intra-service and intra-agency plans. Groups of experts were formed with Service leadership to develop cross-servicing initiatives. Both intra-service and cross-service plans were to be developed with the understanding that recommended actions could be executed within existing authorities, that is, they would not require new BRAC authority from the Congress. T&E principals were asked to participate in developing initiatives to improve the business of T&E. Finally, an accounting firm worked with the Services/Defense Agencies to collect data for a prototype system to improve cost visibility. Each of these initiatives is addressed below.

INTRA-SERVICE AND INTRA-AGENCY PLANS

Each Service and selected Defense Agencies conducted studies of their internal RDT&E infrastructure that focused on identifying options to preserve and enhance current program content while reducing the cost of the RDT&E infrastructure. The definition of infrastructure was as given in Appendix A (page A-24) and is measured as "support costs" in the Cost-Based Management Tool (CBMT) summarized in Chapter 5. The metric established by the section 912 charter (Appendix A, page A-26) was to reduce infrastructure costs (variously also referenced herein as "support" and "overhead") by 10 percent by FY2001 and by 25 percent by FY2005. It is particularly important to emphasize that the goal of the Vision 21/section 912(c)/section 907 efforts has always been to reduce duplication and non value-added work of the laboratories and T&E centers, so that they become more efficient per unit of technical output; not to reduce the scale of their technical programs.

The resulting plans, summarized in Chapter 2, were submitted to OSD. The style and presentation of the plans differ with Service/Agency approach; in general, they each analyze recent trends in the resources for their infrastructure, evaluate the state of the current infrastructure, and develop recommendations for reducing the cost of operating and maintaining it. In all cases, the Services/Agencies point out significant cost reductions that have occurred over the past few years and indicate that the current DoD Future Years Defense Program (FYDP), that extends

to FY2005, already includes additional reductions in resources for the RDT&E infrastructure. Each Service/Agency provided numerous examples of initiatives underway, planned, or being studied that would reduce the cost of the RDT&E infrastructure to meet the goals of streamlining the S&T, engineering, and T&E infrastructure.

Tables ES-1 and ES-2 summarize the baseline and savings planned by the Military Services and Defense Agencies. These savings will pay for undefined Service-wide savings wedges previously placed in the Services' Program Objective Memoranda (POM). While the present study has not led to identification of "new" savings, it has been of value to identify those particular areas of the RDT&E infrastructure where savings can and should be achieved

Table ES-1. Baseline for All Military Services and Defense Agencies

	FY1996 ($B)
Total	**19.034**
Direct	**14.864**
Overhead	**3.711**
Capital Expense	**0.459**

Table ES-2. Projected Savings for Military Services and Defense Agencies

	10%	25%	
	FY2001 ($M)	FY2005 ($M)	Primary Method
Goal	**371**	**928**	
Army	**99**	**229**	**BPR***
Navy	**165**	**388**	**BPR**
Air Force	**269**	**368**	**BPR**
Defense Agencies	**3**	**7**	
Plan Total	**536**	**992**	
	14%	**27%**	

* Business Process Re-engineering

CROSS-SERVICING

Tri-Service sector panels were established with participation by senior (Admiral, General Officer, or Senior Executive Service level) officials most knowledgeable in each Service for eight warfighting or discipline areas. The areas were air vehicles; armaments; electronic combat; command, control, communications, computers, and intelligence (C4I), space; corporate laboratories; medical; and civil engineering/environmental. The sector panels developed initiatives for each area. The result was a total of 47 planned actions, summarized in Chapter 3, some of which could be implemented immediately and others that required further study. None of the planned actions contribute significantly to the projected savings summarized in the previous section.

T&E INITIATIVES

A number of initiatives were undertaken to improve the business of T&E, as summarized in Chapter 4. The areas reviewed included the potential for integrated management, potential changes to the composition of the Major Range and Test Facility Base (MRTFB), possible improvements to test processes, and increasing the use of public-private partnerships. In terms of integrated management, the concept of the T&E Executive Agent arrangement, that includes a Board of Directors (BoD) composed of the Vice Chiefs of the Services, was revalidated. Changes were proposed to improve its defense-wide perspective by adding a senior official from the DoD T&E management staff, the Director of Operational Test and Evaluation, as a member of the BoD. The BoD will explore potential streamlining opportunities by the close of 1999.

The T&E infrastructure included in the MRTFB has had central oversight since 1971 and has a uniform charge policy for T&E activities. The composition of the MRTFB has changed over time, and this study initiated an effort to consider adjustments to the current composition to the MRTFB to make it more responsive to the needs of the Services. An effort was initiated to consider changes to the uniform charge policy for T&E services at the MRTFB that will improve the sound management and financing of the valuable assets included in the MRTFB.

The USD(A&T) chartered a Defense Science Board (DSB) review of T&E processes to examine new and innovative ways that the T&E community could better support the users of test and evaluation. A DSB task force was to look at the role of T&E in rapid and responsive acquisition cycles and at test processes that could be applied to meet the demands of new technologies. The review was to include the examination of industrial principles and practices that could be applied to information gathering and evaluation process in the development of military systems.

Finally, a review of potential benefits of increased public-private partnerships was conducted under the joint leadership of DoD and the National Defense Industrial

Association. The results of that review could lead to more public/private partnering.

Cost-Based Management Tool (CBMT)

One of the objectives of this study was to develop a tool that could provide improved cost visibility for oversight of the laboratories and T&E centers. An accounting firm helped OSD develop a database cost system, and the Services/Agencies provided data to populate the database. These data are presented in Chapter 5 for a baseline of September 30, 1996. While collecting such historical data presented challenges in achieving data consistency, it was agreed that fiscal year end 1996 data provided an appropriate post-BRAC 95 baseline. Populating the CBMT has allowed a better understanding of the complexities involved in collecting and using cost data for the diverse enterprises as represented by the DoD laboratories and T&E centers. Lessons learned from the initial experience will allow OSD to further assess the utility in providing additional cost visibility for these facilities. Future improvement will focus on finding already-existing alternative sources for some of the data to reduce the burden of data collection, refining the definitions of the data elements, reducing the data collection to just those aspects that contribute to improved management, and maximizing the fidelity of the data. The goal is to incorporate these changes in sufficient time to allow capture of fiscal year end 1999 data by April 2000. Continued collection of CBMT data will allow tracking of the Services and Agencies progress toward meeting the FY 2001 and 2005 goals.

Working Capital Fund

Section 907 of the Strom Thurmond NDAA for Fiscal Year 1999 (Appendix A, page A-5) requires the Secretary to consider the use of a revolving fund as one potential methodology for assessing costs. The Department's initial approach to that requirement is summarized in Appendix A (page A-33).

Conclusions

The RDT&E infrastructure has been the subject of numerous studies over the past 10 years. Significant infrastructure resource reductions have occurred over the same period, putting DoD in the position of searching for ways to preserve valuable assets while reducing the costs of ownership. The current study continues that process by identifying ways to streamline management and reduce costs. The largest driver of cost is manpower, and by FY2005, the manpower in the RDT&E infrastructure will have been reduced by more than 40 percent from FY1990. Actions identified during this review will further streamline the RDT&E infrastructure, allowing it to continue to provide essential services within the context of declining resources. An abbreviated list of the recommended actions is shown in Table ES-3.

Table ES-3. Implementation Actions

Category	Action	Responsible Organization	Time
Intra-Service Plans	Implement actions to accomplish 10 percent savings	Army, Navy, Air Force	Sep 2000
	Complete implementation of actions to accomplish 25 percent savings	Army, Navy, Air Force	Sep 2004
Intra-Agency Plans	Complete DTRA initiatives	DTRA	Sep 2004
	Complete JITC initiatives	JITC	Sep 2004
	Complete BMDO initiatives	BMDO	Sep 2004
	Complete OTD initiatives	OTD	Sep 2004
	Complete AFRRI initiatives	AFRRI	Sep 2004
Cross-Servicing	Review results from all Sector panels and identify those recommended for implementation; estimate savings for all that are approved; combine with items from Service/Agency intra-Service/Agency plans that are cross-service proposals.	BoD, Army, Navy, Air Force	Dec 1999
	Identify all actions necessary to implement all sector panel recommends that have been approved as well as those in service intra-Service plans	BoD, Army, Navy, Air Force	May 2000
	Complete all approved cross-service actions	BoD, Army, Navy, Air Force	Sep 2004
T&E Initiatives	Revise and reissue charter for restructuring of BoD T&E Executive Agent Structure	USD(A&T), BoD	Sep 1999
	Complete analysis of proposals for cross-servicing initiatives proposed by BoD and define a plan for consolidation and streamlining actions	BoD	Dec 1999
	Complete interim direction for recomposition of MRTFB and changes for financing in FY02	USD(A&T), DOT&E	Dec 1999
	Reissue DoD Directive 3200.11 and issue an interim change to DoD 7000.14-R to include all changes	DEPSECDEF, USD(A&T), DOT&E, OSD Comptroller	Feb 2000

Category	Action	Responsible Organization	Time
Cost-Based Management (CBMT)	Identify alternative sources of data and refine data definitions	USD(A&T), DOT&E, Services	Dec 1999
	Identify data justified for management use and ensure other reports are not duplicates and are complementary	USD(A&T), DOT&E, Services	Dec 1999
	Issue data call for revised CBMT 1999 data to be provided by April 2000	USD(A&T), DOT&E, Services	Dec 1999
	Complete analysis of 1999 data and make final revision to CBMT	USD(A&T)	Sep 2000

Chapter 1
Introduction

CONGRESSIONAL DIRECTION

The studies that led to the present report began in April of 1998 when the Secretary of Defense (SECDEF) reported to Congress in response to section 912 of the National Defense Authorization Act (NDAA) for Fiscal Year 1998. As part of his report, the SECDEF informed the Congress that there would be follow-on activities including creation of a plan for streamlining the RDT&E infrastructure. Subsequent to the April 1998 report, the Congress included section 907 in the Strom Thurmond NDAA for FY 1999 that, among other things, required this study, which was already underway, to be performed.

This review is the latest of a series of studies, conducted over the past ten years, of the DoD Acquisition Workforce and Infrastructure that focuses on RDT&E infrastructure. Although the acquisition-related workforce and associated facilities have always had regular reviews, the frequency of reviews increased significantly in the post Cold war era, beginning with the 1988 Base Realignment and Closure (BRAC) activities and the 1989 Defense Management Review Decisions (DMRD).

Section 912(c)

Section 912 of the NDAA for Fiscal Year 1998, *Defense Acquisition Workforce*, paragraph (c) directed the submission of an implementation plan to streamline and improve acquisition organizations. Paragraph (d) directed the Secretary to conduct a review of the organizations and functions of DoD acquisition activities and personnel. The direction identified a number of specific issues to be addressed—including opportunities for cross-service arrangements among the services, areas of overlap, duplication and redundancy, and opportunities to further streamline the acquisition process. Paragraph (e) directed the Secretary to incorporate into his Task Force on Defense Reform study an examination of the missions, functions and responsibilities of the various acquisition organizations of the DoD, to include the acquisition workforce. It was to identify areas of duplication in defense acquisition organizations and recommend options to streamline, reduce and eliminate redundancies. Because the Task Force on Defense Reform had been disestablished in November 1997, the Secretary established a Defense Science Board Sub-Task Force on the Acquisition Workforce to address the requirements of paragraph (e).

The Secretary's April 1, 1998 Report to Congress, titled *Actions to Accelerate the Movement to the New Workforce Vision*, provided a response to many of the is-

sues identified in section 912. The report recognized, however, that several of the issues related to RDT&E infrastructure required further analysis and study to define a plan of action. This realization, together with additional requirements directed in section 907 of the Strom Thurmond NDAA for Fiscal Year 1999 (discussed in the following section) form the genesis of this implementation plan.

Section 907

In section 907 of the NDAA for FY1999, Congress directed the Secretary of Defense, acting through the USD(A&T), to analyze the structures and processes of the Department of Defense for management of its laboratories and test and evaluation centers. Taking into consideration the results of that analysis, the Secretary was to develop a plan for improving the management of those laboratories and centers. The plan was to include such reorganizations and reforms as the Secretary considers appropriate.

In this analysis, the Secretary was to analyze each of the following with respect to Department of Defense laboratories and test and evaluation centers:

- Opportunities to improve efficiency and reduce duplication of efforts by the laboratories and centers by designating a lead agency or executive agent by area or function or other methods of streamlining management.
- Reforms of the management processes of those laboratories and centers to reduce costs and increase efficiency in the conduct of research, development, test, and evaluation activities.
- Opportunities for those laboratories and centers to enter into partnership arrangements with laboratories in industry, academia, and other Federal agencies that demonstrate leadership, initiative, and innovation in research, development, test, and evaluation activities.
- The extent to which there is disseminated within those laboratories and centers information regarding initiatives that have successfully improved efficiency through reform of management processes and other means.
- Any cost savings that can be derived directly from reorganization of management structures of those laboratories and centers.
- Options for reinvesting any such cost savings in those laboratories and centers.

Section 907 also addressed a cost-based management information system. The Secretary of Defense was to develop a plan, including a schedule, for establishing a cost-based management information system for Department of Defense laboratories and test and evaluation centers. The system was to provide for accurately identifying and comparing the costs of operating each laboratory and each center.

In preparing the plan, the Secretary was to assess the feasibility and desirability of establishing a common methodology for assessing costs. The Secretary was to consider the use of a revolving fund as one potential methodology.

The Secretary submitted an interim reply to the congressional committees on February 23, 1999, transmitting the Department's section 907(b) plan stating a commitment to full cost visibility and the accounting tools necessary to implement cost visibility.

SCOPE

Vision 21 provided the framework for the section 912(c) and section 907 studies reported here. Among other things, it confirmed the lessons learned from BRAC 95: that is, that laboratories and T&E centers should be considered together, rather than separately as in BRAC 95; and that a Senior Steering Group, incorporating representatives from the Military Departments, Defense Agencies, and OSD must be established to direct the study and adjudicate cross-service issues. Vision 21 also established the definitions of laboratories and T&E centers, the definition of "infrastructure," and the list of laboratories and T&E centers corresponding to those definitions (Appendix A). These products were used to provide the scope for the section 912(c)/907 study reported here.

OBJECTIVES

This study evaluates the requirements and capabilities of all components in DoD to conduct science and technology, engineering (both Product Center engineering and systems engineering), and test and evaluation. The study uses the taxonomy developed under Vision 21, and also evaluates requirements and capabilities from intra- and cross-Military Service perspectives, as well as by warfighting technology area. The objective was to establish the desired RDT&E infrastructure necessary to accomplish the Department's technology program for the 21st Century.

Since all DoD Components are not organized in the same manner, and similar facilities and ranges appear in different organizational areas within the Components, the study reviewed all laboratories and T&E facilities internal to each Military Department and involved organization regardless of discipline and use. It identifies unwarranted or unnecessary duplicative capabilities and determines where major functional efforts could best be focused, from a total systems viewpoint and not from a component viewpoint.

Recognizing the present and likely future fiscal constraints under which the Department will operate, it is critical that the RDT&E infrastructure operate as efficiently as possible. The recommendation and implementation plan include intra-Service/Agency and cross-Service/Agency actions that will reduce infrastructure costs by at least 10 percent by FY2001 and by at least 25 percent by FY2005

against a baseline of September 30,1996 for both laboratories and test and evaluation centers.

Taking into account the results of the study, the Director, Test, Systems Engineering, and Evaluation (DTSE&E) and Deputy Director of Defense Research and Engineering (Laboratory Management and Technology Transfer) (DDDR&E(LM&TT)) have developed an implementation plan for restructuring, reorganizing, and revitalizing the laboratories, engineering centers, and test and evaluation centers, subject to existing authorities. The DTSE&E and DDDR&E(LM&TT) were guided by the following considerations:

1. The method by which DoD will remain a "smart acquirer."

2. Opportunities to achieve efficiency and reduce unwarranted and unnecessary duplication of efforts by consolidating responsibilities for research, development, test, and evaluation, by area or function.

3. Opportunities for competitive sourcing of non-core functions, innovative leasing arrangements of government land and facilities to private sector organizations and other such arrangements to reduce operating expenses.

4. Reforms of the management processes of DoD laboratories and test and evaluation centers that would reduce costs and increase efficiency in the conduct of research, development, test and evaluation in support of National Performance Review goals. Economies which could be achieved by combining separate Laboratory and T&E managements.

5. Benefits of bringing the test ranges and test facilities together under one management structure, based on the principle that DoD's critical test resources are national assets.

6. Opportunities for DoD laboratories and test and evaluation centers to carry out cooperative activities with laboratories in industry, academia, and other Federal agencies, using competitive procedures, where market forces can be utilized for maximum innovation as well as cost, schedule and performance benefits.

7. Alternate organizational structures and reporting chains such as bi-service or tri-service commands, joint rotating commands, GOCO operations, or executive service responsibilities. Ensure that such operations are supported in Program Objective Memoranda by all stakeholders, e. g., the Service components of a joint command.

8. Total cost to the taxpayer (all funding and personnel, direct and indirect costs) of all functional areas for each service.

9. Options for and impediments to reinvesting cost savings in the DoD laboratories and test and evaluation centers.

METHODOLOGY

The USD(A&T) established a Senior Steering Group (SSG) to direct the study and to advise him on the development of an implementation plan for streamlining the RDT&E infrastructure. USD(A&T) chaired the SSG, which included the Service Vice Chiefs, the Service Acquisition Executives, the Principal Deputy USD (A&T), the Director, Defense Research and Engineering, the Director, Operational Test and Evaluation, the Director, Force Structure, Resources and Assessment, the Joint Staff, the Director, Ballistic Missile Defense Organization and the Director, Test, Systems Engineering and Evaluation. The DTSE&E and DDDR&E(LM&TT) directed and oversaw a working group that conducted studies of technology requirements and capabilities of in-house test centers and laboratories/engineering centers to recommend a comprehensive RDT&E structure for review by the SSG. The recommendations include an implementation plan that considers laboratories, engineering centers, and T&E centers.

There were four parallel efforts under this study that are described below.

Intra-Service and Intra-Agency Studies

As a first effort in the study, the three Military Departments conducted studies of their internal RDT&E infrastructure. In addition, other DoD organizations directly involved in the RDT&E infrastructure (Defense Threat Reduction Agency; Ballistic Missile Defense Organization; Joint Interoperability Test Command, Defense Information Systems Agency (DISA); Armed Forces Radiological Research Institute; and the Directorate for Precision Guided Weapons Countermeasures Test and Evaluation) conducted studies of their internal RDT&E infrastructure. These defense agencies, while having only about one percent of the total RDT&E infrastructure cost, were included to provide the Department with a complete picture of the infrastructure status. These internal reviews developed internal options to preserve or enhance program content while reducing infrastructure cost. The results of the intra-service and intra-agency studies are in Chapter 2.

Cross-Service Studies

In an October 7, 1998 memorandum, the USD(A&T) directed the formation of Inter-Service Product Sector Panels to develop cross-service plans (Appendix A, page A-27). The panels considered as a "strawman" set of options those alternatives that had been derived in the course of previous studies of the RDT&E infrastructure. These options proposed aggressive initiatives to increase the cross-utilization of the RDT&E infrastructure. These initiatives were to be negotiated among services, by general officers at the field level. These cross-service studies are detailed in Chapter 3 of this report.

T&E Initiatives

In addition to the tasking issued for the intra-service (and agency) study and the cross-service study, there were issues specific to the T&E area that were identified for study. For each of these issues, a methodology was developed and pursued. The major initiatives were in the area of:

- Integrated Management for T&E Infrastructure
- Recomposition of the Major Range and Test Facility Base
- Improving the Test Processes
- Increasing the Public-Private Partnerships in the T&E Infrastructure

The results of the studies in these T&E areas are summarized in Chapter 4.

Cost-Based Management Tool (CBMT)

One of the objectives of this study was to develop a tool that could provide improved cost visibility for management of the laboratories and T&E centers. An accounting firm helped DoD develop a prototype database cost system, and the Services/Agencies provided data to populate the database. These data are presented in Chapter 5. The prototype system has allowed a better understanding of the complexities involved in collecting and using cost data for the diverse enterprises as represented by the DoD laboratories and T&E centers. Lessons learned from the initial experience will allow the DoD to further refine the CBMT and assess its utility in providing additional cost visibility for these facilities. Future improvement will focus on finding already-existing alternative sources for some of the data to reduce the burden of data collection, refining the definitions of the data elements, reducing the data collection to just those aspects that contribute to improved management, and maximizing the fidelity of the data. The goal is to incorporate these changes in sufficient time to allow capture of fiscal year end 1999 data by April 2000. Continued collection of CBMT data will allow tracking of the Services and Agencies progress toward meeting the FY 2001 and 2005 goals.

ORGANIZATION OF THIS REPORT

The report is organized into six chapters. Following this introductory chapter is Chapter 2, which discusses the efforts taken or planned by each of the Military Departments and Defense Agencies to streamline the RDT&E infrastructure within their own organizations. Chapter 3 describes the cross-service initiatives to streamline the RDT&E infrastructure across the entire DoD infrastructure related to a particular warfighting area. Chapter 4 discusses a set of initiatives that relate to improving the management, efficiency, and effectiveness of the T&E in-

frastructure. Chapter 5 discusses the activities to structure and implement a cost-based management tool (CBMT) within the RDT&E infrastructure. Chapter 6 presents the conclusions and outlines the implementation plan for the actions that resulted from this study.

Chapter 2
Intra-Service and Intra-Agency Plans

As part of this activity, the Military Departments and other organizations within DoD conducted a study of their internal RDT&E infrastructures. These studies responded to OSD tasking to identify options to preserve or enhance program content while reducing the cost of the RDT&E infrastructure. Each of the studies resulted in a plan that was submitted to OSD. The methodology used by each organization varied due to organizational differences as well as completed and ongoing streamlining programs within each of the organizations. The plans are summarized in the following sections. The full texts of the plans are contained in Appendices B through I.

The Executive Summary and body of this report, Chapters 1 to 6, constitute the Department's response to sections 907 and 912(c). In some cases, Appendices B to I contain minority opinions expressed by the Military Departments or other DoD organizations.

ARMY

Background

This section of the report describes the Army intra-service implementation plan. The Army's plan responds to the direction of the USD(A&T) in his August 17, 1998, memorandum, and provides the information by major command (MACOM). The reason for this sorting is the wide divergence of mission responsibilities of the Army laboratories and T&E centers supporting the different commands. For example, not only does the U.S. Army Corps of Engineers have responsibilities for military missions, but it is also responsible for Federal civil works. The U.S. Army Medical Research and Materiel Command provides the Services with the majority of its medical R&D. They have, in recent years, received major funding enhancements by the Congress in new areas such as breast cancer research.

The Army plan not only looks forward to FY2001 and FY2005 as required by guidance, but also puts the required reductions in the context of the overall downsizing of the Army since the peak manpower years of FY1989 through FY1992. Each of the Army MACOMs participated in a wide range of actions that reduced costs prior to FY1996. These included the Defense Management Review (1988–1989), Quadrennial Defense Review (1997), four BRACs (1988–1995) as well as normal Planning, Programming and Budgeting System (PPBS) activities and periodic reviews directed by the Army. As a consequence, some MACOMs have "front-loaded" the infrastructure downsizing so that substantial cuts occurred

before FY1996, the baseline year for this report, while others have taken substantial cuts since FY1996. Each MACOM reports on its downsizing between the peak year and FY1996 and from FY1996 to the goal years of FY2001 and FY2005. An important point to note is that the reductions during those years have included physical infrastructure reductions along with the personnel reductions of engineers and scientists.

Approach

The plan's objective is to identify the Army's FY1996 laboratory and test center infrastructure costs as a function of the eight warfighting technology areas, using the data collected for the Cost-Based Management Tool (CBMT). The Army approach consisted of first identifying the technical costs associated with each of the warfighting technology areas and then determining the percentage of the total technical amount associated with each area. The laboratory and test center infrastructure costs were then identified according to both the financial categories and the infrastructure support taxonomies and a total infrastructure cost was derived. Finally, the percentages derived in the initial step were applied to the total infrastructure costs and an estimate for the infrastructure costs for each warfighting technology areas was determined. Overall, the Army identified support cost of $979 million in FY1996 in six organizations:

- U.S. Army Materiel Command ($711 million in FY1996 support costs)
- U.S. Army Medical Research and Materiel Command ($50.5 million)
- U.S. Army Corps of Engineers ($49.5 million)
- U.S. Army Space and Missile Defense Command ($127 million)
- U.S. Army Operational Test and Evaluation Command ($33 million)
- U.S. Army Research Institute ($8 million)

Appendix B outlines the analyses for savings for each of the Army MACOMs and Field Operating Agencies (FOAs) participating in this study. In the sections that follow, the analysis results and savings plans are briefly summarized. These plans represent a considered evaluation of present options, but it should be recognized that they could change for several reasons. For example, a minor or major change of mission, unforeseen today, could result from congressional or presidential directives or a peacetime or wartime emergency. Or, should the Congress provide BRAC authority, the reductions chosen could change substantially.

Analysis

The CBMT was used as the basis of this infrastructure cost reduction analysis. Costs were broken out into the financial categories listed in Table 1. With the ex-

ception of items 3.7, 3.8, and 3.10, data in each of the categories were allocated to the eight warfighting technology areas (Air Systems, Electronic Combat, Armaments/Munitions, Space Systems, Land Systems, Sea Systems, C4I, Corporate Technologies, Other Technical) as shown in Table 3 below. CBMT data were also collected in the infrastructure support taxonomies listed in Table 2.

Table 1. CBMT Financial Categories

	CBMT Financial Categories
3.1	Military Labor
3.2	Civilian Labor
3.3	Travel
3.4	Contractor Services
3.5	Other Government Services
3.6	Minor Equipment
3.7	Common Level Base Operating Support (BOS)
3.8	Increment Level Base Operating Support (BOS)
3.10	Land Use
3.12	Leased Buildings
3.14	Leased Capital Equipment

Table 2. CBMT Infrastructure Support Taxonomies

CBMT Infrastructure Support Taxonomies
Command Mgt./Admin
Facilities Support
Financial Management.
Human Resources
Contracts Administration
Supply Support
C2 Data Systems
Military Support Act
Other Support

The CBMT data for metric 3.11, Government Owned Buildings, and metric 3.13, Government Owned Capital Equipment, were not factors in any infrastructure computations for a cost reduction baseline.

Table 3. Army Total FY96 Technical and Infrastructure Costs

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infra-structure
3.1 – Mil Labor	136,388	96,855	71.0%	39,533	29.0%	4.0%
3.2 – Civilian Labor	1,427,866	1,082,046	75.8%	345,820	24.2%	35.3%
3.3 – Travel	80,504	67,762	84.2%	12,742	15.8%	1.3%
3.4 – Contractor Services*	2,103,993	1,871,777	89.0%	232,216	11.0%	23.7%
3.5 – Other Gov't Services	539,258	455,455	84.5%	83,803	15.5%	8.6%
3.6 – Minor Equip	272,594	194,140	71.2%	78,454	28.8%	8.0%
3.7 – Common BOS	0	0		136,509		13.9%
3.8 – Increment BOS	0	0		29,135		3.0%
3.10 – Land Use	0	0		15,923		1.6%
3.12 – Leased Buildings	8,210	4,147	50.5%	4,063	49.5%	0.4%
3.14 – Leased Cap Equip	1,358	535	39.4%	823	60.6%	0.1%
Total	4,570,171	3,772,717	79.4%	979,021	20.6%	100.0%
Support Taxonomy						
Command Mgt./Admin				173,355	17.7%	
Facilities Support				282,060	28.8%	
Financial Mgt.				48,295	4.9%	
Human Resources				29,763	3.0%	
Contracts Admin.				37,843	3.9%	
Supply Support				77,765	7.9%	
C2 Data Systems				60,359	6.2%	
Military Support Act				11,372	1.2%	
Other Support				76,642	7.8%	
Common BOS				136,509		
Incremental BOS				29,135	16.9%	
Land Use				15,923	1.6%	
Total				979,021	100.0%	
Warfighting Technology Area						
Air Systems		152,518	4.0%	39,578		
Electronic Combat		44,786	1.2%	11,622		
Armaments/Munitions		1,450,176	38.4%	376,321		
Space Systems		17,133	0.5%	4,446		
Land Systems		442,048	11.7%	114,712		
Sea Systems		6,046	0.2%	1,569		
C4I		568,234	15.1%	147,457		
Corporate Technology		764,598	20.3%	198,413		
Other Technical		327,178	8.7%	84,903		
Total		3,772,717	100.0%	979,021		

Results

Utilizing the support column from Table 3 above, the Army has established the infrastructure cost reduction goals depicted in Table 4 below. The Army's initial assessment is that we will accrue approximately a 10.1 percent reduction by FY2001 (as opposed to the 10 percent goal) and approximately a 23.3 percent reduction by FY2005 (as opposed to a 25 percent goal

Table 4. Planned Infrastructure Reductions through FY2005

Warfighting Technology Area	FY1996 Infrastructure Support Costs	FY2001 Reduction Target		FY2005 Reduction Target	
		$K	Percent	$K	Percent
Air Systems	39.6	4.2	10.6%	9.2	23.2%
Electronic Combat	11.6	1.0	8.6%	2.0	17.2%
Armament/Munitions	376.3	37.6	10.0%	91.6	24.3%
Space Systems	4.4	0.1	2.6%	0.3	6.3%
Land Systems	114.7	11.0	9.6%	27.5	24.0%
Sea Systems	1.6	0.0	0.6%	0	0.0%
C4I	147.5	15.0	10.3%	36.6	24.8%
Corporate Tech.	198.4	22.8	11.5%	42.3	21.3%
Other Technical	84.9	7.2	8.2%	19.1	22.5%
Total	979.0	98.9	10.1%	228.5	23.3%

These reductions will involve personnel reductions as well as other savings initiatives. The Army's plan with respect to personnel reductions utilizing A-76 procedures and general (non–A-76) reductions is shown in Table 5. The summary of the Army's projected savings by MACOM is in Table 6.

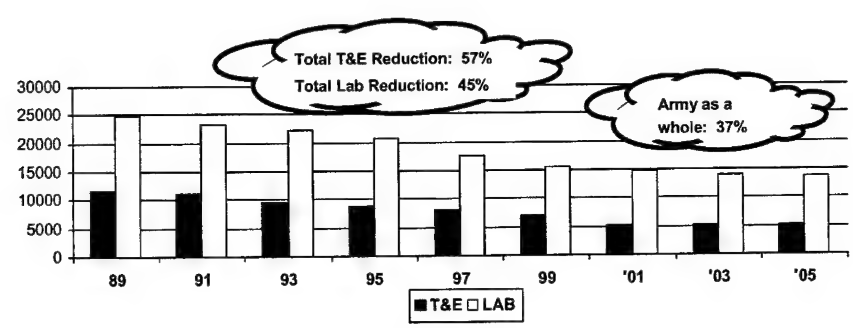

Figure 1. Army Laboratory and Test Center Personnel Trends

Table 5. A-76 and Non-A-76 Personnel Reductions through FY2005

	FY2001	FY2005
Total Infrastructure Reductions	$98.5M	$228.5M
A-76 Personnel Cost Reductions	$14.0M	$15.8M
Non–A-76 Personnel Cost Reductions	$64.6M	$174.9M
Other Cost Reductions	$19.9M	$37.8M
Amount not in FY2000 PB	$7.8M	$18.6M
Personnel Space Reductions		
A-76 Personnel Headcount	456	463
Non–A-76 Personnel Headcount	2,945	3,864

Table 6. Army Projected Savings

	10%	25%	
	FY2001 ($M)	FY2005 ($M)	Primary Method
Goal	98	245	
AMC	71	178	Personnel
MRMC	6	6	Other
CE	6	13	Civilian Labor
SMDC	13	31	KMR
OPTEC	0	0	On Hold
ARI	3	2	Personnel
Plan Total	99	229	
	10%	23%	

While the Army followed the guidance to portray reductions in terms of warfighting technology areas, it should be reemphasized that the savings initiatives are not geared to specific technologies but to infrastructure that covers all technologies within a given site. The reductions that will be generated will be taken in the most efficient and effective areas within our installations.

A significant portion of infrastructure costs included in the CBMT is not under the complete control of RDT&E managers. Subordinate activities, as tenants on installations owned by others, have no control over the cost of common level base operating support. Similarly, Army laboratory and test center managers have only partial control over incremental level base operating support costs and the cost of military labor.

These savings, a portion of which have already been achieved, result from a combination of reductions in facilities and capital equipment, increased efficiency of support services, enhanced management processes, and reductions in general and administrative personnel. No further reductions in infrastructure expenses could be identified between FY2001 and FY2005 that would not result in a loss of core mission capability.

NAVY

Background

The Department of the Navy has followed a pattern of consolidation and reduction of RDT&E infrastructure since the Korean War. Major consolidations occurred in mid-1960 and in mid-1970. Subsequently, the Base Closure and Realignment Act of 1990 provided an additional mechanism to accomplish significant consolidations and to make major base closures while still maintaining the full-spectrum life-cycle support required.

The Navy views RDT&E and in-service engineering as a continuum over the cradle-to-grave life cycle of warfighting systems. There has been a conscious effort to follow this philosophy in the Navy's organizational decisions. The Navy's acquisition establishments have been continually consolidated towards Centers of Excellence in specific warfare areas, which would encompass these full-spectrum responsibilities. As a result of these historic consolidations, the Navy has no separate T&E centers as do the other Services. The Navy's RDT&E centers are more similar to the Army's Research, Development and Engineering Centers, but they have even broader responsibilities. It has been the Navy's experience that this consolidation of responsibility and collocation of effort within warfare areas makes loading and use of facilities, management structures, and coordinated use of personnel more efficient. There is integration across the total span of activities including threat tracking and projection, RDT&E, production support, in-service engineering, and the solution of fleet problems. This organic capability and the corporate memory established from this policy have immeasurable value to the warfighter and the taxpayer.

The Navy uses a Navy Working Capital Fund (NWCF) fiscal system to operate the RDT&E centers in a manner similar to the systems within private industry. Program Managers make a request for support efforts and provide funds for that effort. The RDT&E centers' man-year rates, which make up the charges to the Program Manager, include direct salaries, benefits, and burdened overhead to fund the cost of running the base. They also include charges for all management and administration operations. Therefore, the centers have a continual impetus to operate efficiently, to strive for low man-year rates and high technical capability, in order to respond to Program Manager's needs and budgets. The overhead costs, including base operations, are constantly monitored for areas of reduction. Within the Navy, overhead savings relate directly to program savings, since most

money comes from the programs. There is some institutional funding associated with the Major Range and Test Facility Base (MRTFB) in four of the Navy RDT&E centers, but these funds are administered only for certain facilities or ranges. Most RDT&E facilities within a Navy center do not come under the MRTFB and most RDT&E centers do not presently have any MRTFB funding. Navy has approximately $270 million MRTFB dollars out of a RDT&E center business base of $10.5 billion. Of that business base, 73 percent goes directly to private industry for goods and services.

The Navy experience and "lessons learned" through wars, cold wars, peacekeeping deployments, short-lived skirmishes, and intermittent periods of preparatory peace, show that the organic capability and corporate memory of some level of Navy internal RDT&E are critical to the warfighter and are robustly complementary to the industrial complex. These Navy in-house RDT&E centers are critical to the combination of systems into "systems of systems" and are necessary to translate battlefield needs and counter-threat considerations into acquisition requirements. They are also helpful in selecting the proper industrial firms to develop the warfighting systems and ascertaining that the systems produced meets the requirements and will be viable upon warfighter use.

The Navy made significant use of the opportunity provided by the 1990 Base Closure and Realignment Act. The Navy had a total of 178 BRAC actions. This included 135 closures and 43 major realignments. The up-front costs were $10.3 billion. However, $15.7 billion have been saved to date with additional out-year savings of $2.6 billion annually. The Navy completely closed 13 RDT&E sites and 27 RDT&E activities that were tenants at host sites. The BRAC efforts also allowed the Navy, through consolidation, to purify and control missions across all of the centers. In addition, BRAC allowed the Navy to cross-service and collocate major efforts to, or with, other Services. These included jet engine testing, aircrew systems testing, and a number of specialized research areas. Concurrent with BRAC actions, the number of technical personnel within the Navy has been reduced 4 percent per year since 1989 and the workforce is now 42 percent lower than when the reduction, assimilation, and consolidation started.

Approach

The Navy approach to the internal review of streamlining options consisted of updating earlier work done under the Vision 21 activity to consider the current situation within the Navy.

Section 277 of the NDAA for FY1996 required the Department of Defense to submit a plan and legislative requirements for minimizing the number of laboratories and T&E centers within the Department. The activity, labeled Vision 21, included both intra-service and inter-service efforts. The Navy internal, predecisional outline identified additional sites that could be closed, other consolidations, buildings to be razed, processes to be changed, and efforts for cross-service considerations. This outline was never formally completed and approved. When

new Base Closure and Realignment authorization was not provided for Vision 21, work on the plan was halted. However, the strategy was used as the foundation for this study group effort.

The Navy used the previous Vision 21 internal pre-decisional strategy as a starting point for its section 912 internal plan, but with the proviso that no planning for base closures could occur. Each major Systems Command submitted individual draft plans that were ultimately coordinated together by an inter-command working group and modulated by a Senior Naval Oversight Group, chaired by the Vice Chief of Operations. The Assistant Secretary of Navy (Research, Development, and Acquisition) and the Systems Command Commanders were among the members of the oversight group.

A Navy internal plan outline was compiled from input from each of the Navy Systems Commands who have responsibility for various warfare areas. The three major commands directly concerned with warfighting systems are: Naval Air Systems Command (NAVAIR), responsible for aircraft, air armaments and all Navy missile systems; Naval Sea Systems Command (NAVSEA), responsible for submarines and surface ships and the weapons systems for those platforms (with the exception of missiles); and Space and Warfare Systems Command (SPAWAR), responsible for command, control, computing and intelligence gathering systems. The Office of Naval Research (ONR), the Naval Supply Command, and the Naval Facilities Command (NAVFAC) also were involved with the plan preparation. The senior civilian from each of the commands formed a working group to coordinate initiatives across the Navy Department and to provide a draft plan to the Senior Naval Oversight Group for final determinations. Many of the initiatives were also collected from ongoing studies within the Navy Department and within each of the individual commands to streamline, downsize, and operate the RDT&E infrastructure more efficiently.

Results

The results of the Navy internal plan are described in greater detail in Appendix C. Table 7 summarizes the reduction efforts of the Navy major RDT&E organizations. The table outlines considerations for internal consolidations, workload movement, cross-service considerations, and business process re-engineering and other management efficiencies from ongoing studies. All initiatives shown in the table can be implemented within existing authorities. It is estimated that these actions will result in the elimination of 3,500 personnel spaces.

Table 7. Summary of Navy Plan

	SPAWAR	NAVAIR	NAVSEA	ONR	NAVFAC
Migrate or Curtail Work		• Additional consolidation of weapons workload with NAWC • Energetics & Missile lead to NAVAIR	• Energetics & Missile lead to NAVAIR	• Radio Astronomy Fac., MD Point • Comm Research Fac., Waldorf, MD • Lt. Gas Guns, DC	• Look for cost-share opportunities (low private sector RDT&E) • Concentrate on specialization
Consolidate Intra-Navy (By Area or Function	• Consolidation Complete under BRACs	• Energetics & Missiles/Atmos Flight Weapons to NAVAIR	• Energetics & Missiles/Atmos Flight Weapons to NAVAIR • Boats & Craft		• Consolidation complete under BRACs
Cross Service (Alt. Org Structures)	• Joint Integration & Interoperability Offices – CINC IPOs	• Engage Army on Rotorcraft RDT&E	• Engage Army & USAF on Boats & Craft • Review NV Electro Optics with Army		• All R&D redistrib via Project Reliance – only waterfront facilities R&D left
Competitive Sourcing (Non-Core Functions)	• Execute Navy Business Plan • A-76 (as appropriate)	• Execute Navy Business Plan • A-76 (as appropriate) – Base & other support – T&E Range & Facility support functions	• Execute Navy Business Plan • A-76 (as appropriate) • Identify & retain Core Equities	• Execute Navy Business Plan • A-76 appropriate overhead services	• Execute Navy Business Plan • Eliminate ISA accounting support • Implement Acquisition Reform
Cooperative Arrangements & Innovative Leasing		• Energetics, industry & government coop efforts & co-use facilities @ CL	• Outleasing • Dual-Use Facilities • "Re-Footprint" Facilities		• MOUs w/Research Foundations exploit collab with Private Sector
Management Efficiencies (Process Change)	• BPR	• BPRs on T&E Software Dev, Property Mgt • Integrated RDT&E Mgmt @ PAX & CL	• BPR at Sites • Proposed Sect 246 pilot for NUWC • Align with Systems Eng & Hq • Bldg demolition	• Consolidate 3 Research Divisions • Building demolition of 425Ksq ft.	• Cost Control Sys • Competence Mgmt • Perf Measures • Mgmt O/H efficiencies

Savings

Tables 8 displays the Navy baseline while Table 9 outlines the estimated saving associated with the total Navy internal plan. They are keyed to the major initiatives in the plan outlined for each Major Claimant and attendant warfare areas. The claimants are organized differently, are different in composition and size, and have completed different levels of consolidations and reductions, so their internal efforts, thrusts, and savings are also different. These estimates are considered to be conservative and are not all inclusive. As presently identified, they fall short of the required section 912 savings within the Navy RDT&E infrastructure.

Table 8. Navy Baseline

	FY1996 ($B)
Total	9.708
Direct	7.732
Overhead	1.726

Table 9. Estimated Savings from Navy Plan

	Expected Savings (FY96 $M)	
Area of Consideration	**FY2001**	**FY2005**
Migrate or Curtail Work	**TBD**	**$36.00***
Consolidate Intra-Navy (By Area or Function)	**TBD**	**TBD**
Cross Service (Alternate Organizational Structures)	**.15**	**1.80**
Competitive Sourcing (Non-Core Functions)	**40.40**	**72.60**
Cooperative Arrangements & Innovative Leasing	**.54**	**1.40**
Management Efficiencies (Process Change)	**123.70**	**277.80**
Total Estimated Savings** (Without Supportive Environmental Initiatives)	**165.00**	**352.00**

Note: TBD – To be determined.
* Not included in total.
** FY1996 baseline overhead was $1.7B.

The total annual saving from the actions in the Navy plan have been estimated as at least $388 million. The $36 million savings associated with workload movement within NAVAIR is additive to the total estimated saving of $352 million at the bottom of Table 7. The additional movement of weapons workload across the two major commands and the efforts finally worked out in additional cross-service activities will increase the savings by some amount that is yet unknown.

The estimate of cross-service saving is presently small. However, there is significant cost avoidance associated with Tri-Service Reliance program activities and the various initiatives of consolidation and collocation implemented under BRAC actions. The Navy has been the leader among the Services in both dependence on another Service and the collocation of similar efforts. Notable has been the closing of the Trenton RDT&E Center and the dependence on the Air Force for all jet engine testing. Crew systems testing, clothing R&D, land systems, training systems, and medical research are among other areas of dependency or collocation. In addition, some of the tactical aircraft and air-launched weapons programs are now joint programs, which may help to minimize overlaps and duplications. There are more high-level tri-service coordination groups being established to provide integration and to control unnecessary duplications. There are still areas that will be pursued to provide closer coordination across the Services. However, the Services will ensure that their core competencies are not adversely affected.

The savings produced by additional cross-service efforts are not included in the Navy's internal plan.

Schedule of Actions

The Navy Internal Plan implementation will start immediately. In fact, some of the initiatives are already being executed as a part of other on-going efficiency efforts tied to meeting savings wedges. Organizational changes are being initiated and workload movements will occur as soon as practicable, but in concert with program requirements and personnel assignments. It will take some time to fully implement the plan. The implementation could be accelerated and additional significant associated actions could be taken if BRAC authority was granted.

Conclusions and Summary

The Navy Internal Plan outlines general and specific efforts that will allow the Department to meet the 10 percent and 25 percent infrastructure savings goals. Many of the efforts are intertwined with ongoing efficiency initiatives. Savings are anticipated above those delineated in this plan and the identification of those savings just attendant to the section 912(c) study will be difficult, if not impossible, as time progresses.

It is not anticipated that many civil servant reductions will be offset by contractor personnel from these initiatives because the focus is on process changes within the infrastructure. The exception would be in the competitive outsourcing area, where industrial personnel could replace civil servants if industry wins the competition. The plan only includes small net savings in those instances.

Most of the savings are from the infrastructure and support areas and not from direct technical program efforts. Much of the savings are related to support personnel. However, in some instances, because of consolidation opportunities, some personnel previously on direct programs will be discharged and replaced by fewer direct personnel at other areas. Specific programs will be prioritized and the higher priority programs will be executed first under the end-strength personnel limits. There is very little overhead directly outlined in the Navy Budget because of the NWCF fiscal system.

There will be program savings as a result of the Navy internal plan. The costs to the programs will be less because man-year rates at the RDT&E centers will be lower due to infrastructure/overhead savings. Because of the NWCF, the majority of overhead and infrastructure dollars comes directly from program funding. Therefore, when infrastructure is reduced, there are savings to the programs. Savings and cost avoidance from additional cross-service initiatives are possible, but not considered in the Navy's Internal Plan. Significant reductions of infrastructure footprint relating to buildings and facilities are planned. Some efforts are in process, while others are waiting funding and authorization. Additional

rounds of Base Closure and Realignment would be extremely beneficial to the Navy in order to complete the necessary infrastructure reductions.

AIR FORCE

Background

Over the past 20 years, the Air Force has taken steps to reduce its RDT&E infrastructure costs and to operate as efficiently as possible. The Air Force has closed or consolidated 7 major test facilities and mothballed over 50 additional test assets at the 3 remaining test centers. The Air Force has consolidated its Science and Technology activities under one laboratory organization, Air Force Research Laboratory. The Air Force has merged two major commands to create the Air Force Materiel Command (AFMC), responsible for both acquiring and sustaining Air Force weapon systems. The Air Force has further reorganized AFMC into business areas and will recognize a 47 percent manpower reduction and a $5B cost reduction from FY1989 through FY2005. These changes taken together virtually eliminate the excess capacity identified in the BRAC 95 studies. In those studies, demonstrated peak capacity (from the late 1980's) was the baseline. The overall workload and output of the RDT&E activities has not decreased appreciably since those peak years, but the manpower is dramatically lower highlighting the tremendous increases in overall efficiency and the elimination of that excess capacity. The Air Force is actively working partnerships with industry in such areas as space lift, satellite control, space systems testing, RCS measurement, avionics development testing for the F-22 aircraft, munitions seeker testing, and joint infrastructure planning. The Air Force enthusiastically supports the Tri-Service Reliance program.

The Air Force plans to continue shaping the Air Force RDT&E infrastructure and has met the OSD infrastructure cost-reduction objective. In developing its plan, the Air Force focused on the core RDT&E competencies necessary to develop, acquire, test, and provide in-service support for the weapon systems needed to meet Air Force mission requirements. This strategy allowed the Air Force to preserve core Air Force technical capabilities and identify those that could be either divested or relied upon from another Service, Agency, or commercial provider. As a result, the Air Force identified and committed to infrastructure cost savings of approximately $362 million (from the FY1996 baseline) by FY2005.

Approach

The Air Force approach to its inter-service study was to identify and develop a "best value" position for established Air Force strategic interests, which became the basis for all Air Force studies and senior-level discussion with the other Services and the OSD section 912 study group. Best value includes the quality of the product/output, the efficiency of the process, and the cost per unit output, which were not necessarily reflected in the total cost (a concern associated with using

the CBMT data.). For the Air Force, the ultimate driver was the impact/cost to the warfighter/user. The Air Force operational community was directly involved in assessing options and building the best value business case. Using an initial methodology that employed the work breakdown structure (WBS)/taxonomy developed during the Vision 21 Study, four product working groups were established. These groups addressed the major product lines of concern to the Air Force. These product areas are:

- Aeronautical (Airborne Directed Energy, Fighter, Bomber, Reconnaissance/Surveillance, Rotary Aircraft, Special Operations Forces, Spaceplane, Transport, Tanker, Trainer, and Unmanned Aerial Vehicles),
- Space (Spacecraft, Launch Vehicles, Space Ground Segments, ICBMs),
- Air Armaments (Conventional, Directed Energy, Nuclear), and
- C2I (Global Awareness, Global Grid, Operation Centers, Integration).

The four product working groups were tasked to:

- Define why the Air Force needs "organic" technical competency and supporting RDT&E infrastructure;
- Determine what the appropriate amount of organic infrastructure is to facilitate/sustain competency for the four major product lines;
- Define what organic technical core competencies are required for each product line;
- Identify what technical capabilities have cross service/streamlining potential;
- Identify what infrastructure exists and where it is located; and
- Identify how much this capability and infrastructure costs now and could cost the Air Force in the future.

To pursue its approach, the Air Force developed a decision matrix for the four product groups to use as they reviewed the RDT&E infrastructure for Air Force products/programs. The decision matrix led the product groups to assign activities to one of following four categories.

Category A: The Air Force is the Provider of Choice

This class of weapon systems/subsystems is central to the Air Force core competency. The Air Force is (and is expected to continue to be or become) the principal DoD/national user. This category includes joint activity up to and including the Air Force acting as lead Service or joint Service host.

CATEGORY B: OTHER SERVICE/AGENCY IS THE PROVIDER OF CHOICE

This class of weapon systems/subsystems is central to the Air Force core competency. The Air Force and other Services/Agencies are principal national users and the Air Force is not expected to become the dominant user. In this category, technology is evolving and is not expected to have significant commercial value. There is joint activity up to and including services purchased from another military department or government agency.

CATEGORY C: COMMERCIAL SECTOR IS THE PROVIDER OF CHOICE

This class of weapon systems/subsystems is central to the Air Force core competency. The Air Force and other Services/Agencies are not and are not expected to become the principal national users. Technology in this product area is mature or moving rapidly in the commercial sector.

CATEGORY D: NO INFRASTRUCTURE REQUIREMENT

This class of weapon systems/subsystems is *not* central to the Air Force core competency. There is no continuing or anticipated user requirement. The risk of not having Air Force RDT&E infrastructure is acceptable.

Results

The Air Force recognizes the need for the Air Force RDT&E infrastructure to operate as efficiently as possible and has actions underway to ensure that is the case. During the course of its internal infrastructure review, the Air Force identified actions to enhance the performance of its internal infrastructure and investigated the potential for additional cross-service cooperation. The Air Force operational community was directly involved in assessing options and building the best value business case. As a result, the Air Force plan represented a corporate Service position that was strongly supported, not only by operational users in the field at Air Combat Command, Air Force Space Command, Air Mobility Command, and Air Education and Training Command, but also by the acquisition community in Air Force Materiel Command, Air Force Research Laboratory, and the corporate staff at HQ USAF, including the acquisition, logistics, installation, and test/evaluation functions. The result of that review includes the following conclusions:

1. The Air Force developed a "smart business" approach to RDT&E infrastructure reductions. Even before section 912 actions, the Air Force began to identify opportunities to better structure its own infrastructure and develop internal Service options to reduce cost. The result of that internal look, combined with OSD and congressional section 912 actions, is that Air Force warfighters are provided "best value" as the Air Force RDT&E community balances organic infrastructure with reliance on other Services, Agencies, and the private sector.

2. The mission of the Air Force is to defend the United States through control and exploitation of air and space. The Air Force continues to dominate the four product sectors central to its mission: Aeronautical, Air Armament, Space, and C2I. Although there are efficiencies that can be realized in DoD and the other Services by "leveraging" the Air Force's RDT&E infrastructure for joint Service potential, the Air Force must retain that RDT&E infrastructure that is central to Air Force Core Competency, particularly in Aerospace, Aeronautical, and Air Armament systems.

3. The Air Force will continue to streamline its RDT&E infrastructure to ensure its core competencies. The Service developed a sound process to determine the appropriateness of keeping organic RDT&E infrastructure in place, leveraging joint cooperation, or relying on industry. The Air Force is correctly "positioned" in its weapon system product sectors to identify and transition technology to industry.

4. As the Air Force continues to meet warfighter needs, it will "buy down risk" largely through outsourced engineering development and acquisition. In fact, greater reliance and partnering with industry is the best opportunity to reduce Air Force infrastructure costs.

5. The Air Force will meet or exceed OSD's infrastructure cost reduction goals of 10 percent by FY2001—25 percent by FY2005. Most of these savings result from reengineering, competitive sourcing and privatization and most are already included in the FYDP. Projected savings do not include adjustments for the results of A-76 actions, which will vary depending on whether the government or commercial sector wins A-76 competitions.

Detailed Air Force actions to reduce RDT&E infrastructure costs are provided in Appendix D.

Savings

The four Product Sector Working Groups presented recommendations that would result in a manpower reduction against a September 30, 1996 baseline of 5,947 authorizations (28 percent) and a total cost reduction of $368 million (almost 37 percent) by FY2005. The baseline is shown in Table 10 and the savings, summarized in Table 11, need to be reconciled with current downsizing (such as A-76 actions) and re-engineering plans in the current budget submissions.

Table 10. Air Force Baseline

	FY1996 ($B)
Total	4.315
Direct	3.235
Overhead	0.993

Table 11. Summary, Savings from Air Force Panel Recommendations

	10% FY2001 ($M)	25% FY2005 ($M)	Method
Goal	99	248	
Air	183	252	BPR
Space	31	36	BPR
Arms	44	69	BPR
C2(ESC)	5	5	BPR
C2(Rome)	6	6	BPR
Plan Total	269	368	
	27%	37%	

Note: Savings are based on review of entire RDT&E workforce.

The Air Force is committed to carrying out its internal Service plan that will generate approximately $368 million in savings through FY2005. The Air Force will continue to downsize in place and reduce cost while preserving individual Service core competencies. These savings are substantial - meeting or exceeding OSD's infrastructure cost reduction goals of 10 percent by FY2001 and 25 percent by FY2005—and have either already been realized or are programmed in the Air Force FY2001 Amended POM.

OTHER ORGANIZATIONS WITHIN DOD

In the course of this study, it was determined that other organizations that had laboratory and T&E missions should participate in the study. The following sections address the activities that are conducted by the organizations. The magnitude of this effort must be recognized when reviewing these results. The sum of the resources being expended by these organizations in laboratory and T&E is approximately one percent of the total laboratory and T&E expenditures of the Department. Therefore, while it is important to include these organizations in the review and examination, the magnitude of any savings from within these organizations is limited within the scope of the Department.

The organizations that were directed to participate in this study were

- Defense Threat Reduction Agency (DTRA)
- Joint Interoperability Test Command (JITC)
- Ballistic Missile Defense Organization (BMDO)
- Precision Guided Weapons Countermeasures Test and Evaluation Directorate (OTD)
- Armed Forces Radiobiology Research Institute (AFRRI)

Defense Threat Reduction Agency

The Defense Threat Reduction Agency (DTRA) maintains a RDT&E infrastructure to develop and apply technology solutions across the entire spectrum of weapons of mass destruction (WMD) threats, including biological, chemical, nuclear, and radiological. DTRA is not a laboratory and does not have test ranges to support its technology development. DTRA outsources its science and technology (S&T) program and maintains a simulator and technical test activity that is used to validate its WMD technologies. Nuclear Weapons Effects (NWE) simulators replicate x-ray, gamma, electromagnetic pulse, and blast/thermal environments. High explosive (HE) test activity supports the study and modeling of weapon-target interaction and blast/shock phenomenology. As a result of recent infrastructure reviews accomplished with the stand-up of DTRA, the NWE simulator and HE field test activity were determined to be integral to the DTRA mission.

DTRA's RDT&E infrastructure plan is structured to achieve the FY2001 goal ($7M) established for this study. In FY1999, DTRA will request the Defense Science Board to review all remaining simulators to study the need to maintain a suite of unique T&E facilities or mothball several of them. Depending on the outcome of this study, the FY2005 goal will be met by balancing savings across taxonomy areas such as T&E mission support, contractor support, and other government services. Since the FY1996 baseline, DTRA has consolidated and streamlined selected simulator and technical test activity. Although DTRA does not have laboratory infrastructure to divest, the Agency continues to rely on a strategy to outsource to the maximum extent possible. Technical facilities are located on military installations, which has resulted in efficiencies, and several are operated and maintained by contractor personnel. From a cross-Service perspective, DoD nuclear S&T and supporting technical capabilities have been consolidated in DTRA. The NWE simulators and HE test activities are unique to DTRA's WMD research and are not duplicated elsewhere in the Department. Additionally, DTRA has partnered with the Department of Energy (DOE) to coordinate respective core competencies in NWE simulator capabilities and computational capabilities for nuclear stockpile sustainment.

Joint Interoperability Test Command

The Joint Interoperability Test Command (JITC), DISA, is DoD's primary organization for evaluating the interoperability of command, control, communications, computers, and intelligence (C4I) and combat systems. JITC's infrastructure consists of approximately 20 test laboratories in three facilities located at Ft Huachuca, AZ; Cheltenham, MD; and Virginia Square, National Capitol Region. This infrastructure provides T&E services to a broad customer base comprised of the CINCs, Services, and Defense Agencies; other Federal agencies; and commercial vendors. Approximately 250 military and DoD civilian personnel and 450 contractor employees provide the technical expertise required to support T&E activities.

JITC has a very small infrastructure budget and operates on a reimbursable basis. In FY1996, JITC institutional funding was $8M, which provided approximately 13 percent of the funding needed to conduct JITC test activity. User direct reimbursements in FY1996 were approximately $52M. The JITC goals for FY2001 and FY2005 cannot be accomplished without a severe impact to the test services provided to a growing number of joint programs requiring interoperability test and certification. As the only joint OTA, JITC workload will continue to expand to support C4I systems being developed by DISA, DLA, DFAS, and BMDO.

Ballistic Missile Defense Organization

The Ballistic Missile Defense Organization (BMDO) is responsible for managing, directing, and executing the acquisition of joint missile defense systems. BMDO does not have a laboratory infrastructure, but does maintain a test and evaluation infrastructure as part of its mission. The missile defense mission area depends heavily on the MRTFB test facilities and BMDO does provide support for some of these facilities, while the Military Departments and other organizations provide the facility management. In addition, BMDO funds several capabilities that are unique to missile defense. These include Kinetic Kill Vehicle Hardware-in-the-Loop Simulator, the National Hover Test Facility at Edwards AFB, and the BMDO Joint Nation Test Facility (JNTF).

BMDO is in the process of responding to various recommendations concerning its ground simulation and ground and flight testing programs. BMDO is also using cross-servicing approaches to satisfy some of its testing needs. BMDO has been reducing its infrastructure costs in a number of ways. The budget for the JNTF is now at one-half the level of FY1990 and BMDO has a goal of reducing the technical infrastructure by 2 percent annually. The acquisition of joint missile defense systems will continue to place high demands on the T&E infrastructure and require new or modified capabilities. Within this context, there will be attention to the objective of reducing any unnecessary cost of the infrastructure.

Precision Guided Weapons Countermeasures Test and Evaluation Directorate (OTD)

The Office of the Test Director (OTD), Precision Guided Weapons Countermeasures (PGWCM) Test and Evaluation (T&E), ODTSE&E, conducts countermeasure/countercountermeasure test activities applicable to all precision guided weapon (PGW) systems and related components. Since 1972, OTD has conducted approximately 300 developmental and operational analyses, tests, and evaluations of both U.S. and foreign PGW systems. These continuing, service-independent activities have resulted in a comprehensive test capability and knowledge base, which has been extremely effective and influential for developers, tacticians, warfighters, and decision makers. Over the past 25 years, the OTD budget, corrected for inflation, has remained relatively constant while workload and customer base have increased. OTD is a one-of-a-kind Joint warfighting support activity that is supporting two major operational concepts of Joint Vision 2010—precision engagement and full dimensional protection. The FY2001 and FY2005 goals for this study will have a major impact to the joint cooperative testing, analysis, and evaluation services provided to Service, CINC and OSD programs.

Armed Forces Radiobiology Research Institute

The Armed Forces Radiobiology Research Institute (AFRRI) is a tri-Service laboratory that conducts research on methods to prevent, assess, and treat injuries resulting from the effects of ionizing radiation. AFFRI infrastructure includes a variety of radiation sources (medium-sized reactor, a cobalt-60 gamma irradiation facility, linear accelerator, and industrial x-ray machine) and an accredited animal research facility. In-house research teams in the areas of dosimetry, depleted uranium, nuclear/biological/chemical interactions and countermeasures, and casualty management conduct AFRRI research.

The AFRRI plan is to achieve the FY2001 and FY2005 infrastructure goals primarily through savings already included in the POM. In 1992, the AFRRI program was reduced from $17.9 million to the $11.0 million FY1996 baseline starting point. Based on the FY1996 baseline, the updated POM reduces the entire AFRRI budget beyond the infrastructure goals.

DoD Organization Summary

Tables 12 and 13 summarize the projected savings for the other DoD organizations participating in the study.

Table 12. Baseline

	FY1996 ($B)
Total	0.185
Direct	0.129
Overhead	0.055

Table 13. Projected Savings

	10%	25%	
	FY2001 ($M)	FY2005 ($M)	Primary Method
Goal	12.9	32.3	
DTRA	2.3	5.8	BPR
JITC	—	—	
BMDO	*	*	
OTD	—	—	
AFRRI	0.6	1.5	BPR
Plan Total	2.9	7.3	
	2.2%	5.7%	

* JNTF workload and requirements increase after the FY1996 baseline and remain above that level throughout the program years.

SUMMARY

Tables 14 and 15 summarize the projected savings generated for the 912/907 study.

Table 14. Baseline for All

	FY1996 ($B)
Total	19.034
Direct	14.863
Overhead	3.711

Table 15. Projected Savings for All

	10%	25%	
	FY2001 ($M)	FY2005 ($M)	Primary Method
Goal	371	928	
Army	99	229	BPR*
Navy	165	388	BPR
Air Force	269	368	BPR
Other DoD Organizations	3	7	
Plan Total	536	992	
	14%	27%	

* Business Process Re-engineering

Chapter 3
Cross-Servicing

Initial Cross-Service Discussions

There have been a number of studies on determining which cross-service activity among DoD Components might be practicable and beneficial. Some of these studies have been related to the various Reliance efforts for both S&T and T&E, the Cross-Service BRAC efforts, the Test & Evaluation Board of Directors efforts and those efforts associated with section 277 of the National Defense Authorization Act of 1996. Changes, consolidations, collocation, definitions, documentation and dependencies have resulted from these studies. However, the Military Departments have all determined that there are core responsibilities that they can not relinquish and for which they must have direct responsibility to meet the readiness requirements of Title 10, U.S. Code.

Sector Panels

A procedure used in cross-servicing studies under section 277 seemed to be the most successful and was therefore used to consider additional cross-servicing, in eight discipline areas as part of the Department's renewed effort undertaken pursuant to section 912. Tri-Service "Sector Panels" were established at the Admiral, General Officer, or Senior Executive Service level for the areas of (1) Air Vehicles, (2) Armaments, (3) Electronic Combat, (4) C4I, (5) Space, (6) Corporate Laboratories, (7) Medical, and (8) Civil Engineering/ Environmental. These Tri-Service groups were composed of either the direct managers or the most knowledgeable flag-level officers within each Military Department. They were tasked to ascertain what additional cross-servicing could be agreed to without jeopardizing any Military Department's core responsibility. They also had to consider the restrictions of the current law concerning base realignments and closures. These teams all recommended increased high level coordination within each discipline area. In addition, there were specific efforts designated for consideration for change, consolidation, or collocation. The results from each "Sector Panel" are presented in the subsections that follow.

Aircraft

- The Joint Aeronautical Commanders Group will review cross-service aircraft T&E infrastructure investments and report to the present T&E Board of Directors which is made up of the Service Vice Chiefs.

- Memorandums of Agreement will be developed to share test infrastructure.
- The Air Force will be responsible for bombers and land based tactical and Airborne Early Warning aircraft and maintain a T&E capability at Edwards AFB.
- The Air Force will divest responsibility for low altitude airborne manned tactical reconnaissance.
- The Navy will be responsible for carrier based tactical and Airborne Early Warning aircraft (includes strike-fighter, AEW and EW) and will maintain a Navy unique T&E capability at NAS Patuxent River.
- The Army will remain the DoD S&T rotorcraft lead (less propulsion and avionics).
- The Army will use the Navy Sea-Based Simulation capability for Army Rotorcraft shipboard Qualification.
- A DoD national rotorcraft test center will be created at the Navy's Patuxent River facility for all rotorcraft air vehicle airworthiness qualification.
- The Army, Navy, and Air Force will develop a joint program for rotorcraft integrated avionics.
- The Army will maintain a dedicated rotorcraft technical test capability at Ft. Rucker.
- The Navy will maintain responsibility for sea based service unique rotorcraft and V/STOL aircraft at the NAS Patuxent River facility.
- The Air Force will maintain responsibility for rotorcraft service unique mission equipment.

Armaments

- Establish an armament tri-service board of directors within the Joint Aeronautical Commanders Group.
- Air Force divest its Aeroballistics Research Facility and rely on the Army.
- Consolidate all munitions open-air electro-magnetic interference testing with the Army at TECOM.
- Consolidate all missile safe and arming and proximity fuze testing with the Navy at NAWCWPNS China Lake.

- Air Force divest small guns, most air-to-surface guns and unguided ammo and rely on the Army.
- Air Force to consider the feasibility of divesting tactical propellants efforts to Navy and Army.
- Consolidate to a Tri-Service Directed Energy Center with the Air Force at Kirtland AFB.
- Consolidate outdoor Radar Cross Section measurement with the Air Force at Holloman AFB.
- Consolidate small caliber guns (i.e., less than 20mm) with the Army.
- Establish the Army as the Tri-Service lead for electric guns.
- Continue close coordination on joint programs.

Electronic Combat

- Complete implementation of Electronic Combat Master Plan presented to Congress by the Air Force consolidating its electronic warfare (EW) test capability from Eglin, REDCAP, and AFEWES to Edwards AFB and the Air Force Nellis Range Complex. Air Force to migrate AFEWES IR capability to industry or another Service.
- Close the Navy Junction Ranch RCS complex.
- Foment a closer partnership and cooperation between the Navy Echo Range and the Air Force Nellis Range Complex.

C4I

- Continue with the OSD initiative to implement a Joint C2 Integration and Interoperability Group.
- Establish a CINC Interoperability Program Office.
- Establish a Joint Forces Program Office.
- Connect Cross-Service Integration Facilities for Joint Integration/Interoperability.
- Establish a joint program for radio R&D and procurement.
- Establish the Army as the principal buyer for theater communications.
- Establish a Joint Tactical Data link office at SPAWAR San Diego.

Space

- Air Force is the primary DoD lead for space acquisition and T&E, largely based on operational infrastructure.
- Explore creation of a virtual space-vehicle, satellite control network.
- Increase inter-service cooperation under the space technology alliance.
- Rely on operational space infrastructure whenever possible.
- Continue cooperation in programs and individual projects.

Corporate Laboratories

- Continue to share expensive facilities.
- Create a corporate laboratory directors' forum to ensure closer coordination.

Medical Research

- Continue with lead Service responsibilities.
- Continue with consolidation and collocation initiatives.
- Services continue to work within Armed Services Biomedical Research framework for inter-service efficiencies.

Civil Engineering and Environmental Quality

- Continue with Joint Engineer Management Panel.
- Continue with Joint Group on Pollution Prevention.
- Continue with Tri-service Environmental Center Coordinating Committee
- Continue with Tri-service Reliance assignments and coordination

Summary

The "sector panel" groups all reviewed the previous study results on cross-servicing related to BRAC, Reliance, T&E Board of Directors, and Vision 21. Some of the above results were derived from these previous studies. Each group also illuminated the significant consolidations, collocations, coordination, and dependencies that have already been established by the Military Departments. The primary emphasis from these "sector panel" groups was to ensure close commu-

nication and cooperation among the Military Departments in the eight areas by setting in place additional mechanisms, or by strengthening those already in place. These oversight mechanisms will enhance the Tri-Service Reliance Program efforts to eliminate unwarranted duplication yet ensure that the Service's core responsibilities are not jeopardized.

All of the "sector panel" recommendations will be taken for action by the Military Departments. Those that are deemed feasible and cost-effective will be immediately implemented.

Chapter 4
Test and Evaluation Initiatives

INTRODUCTION

In addition to the tasking issued for the intra-service (and agency) study and the cross-service study, there were issues specific to the T&E area that were identified for study. For each of these issues, a methodology was developed and pursued. The major initiatives were in the area of:

- Integrated Management for T&E Infrastructure;
- Recomposition of the Major Range and Test Facility Base (MRTFB);
- Improving Test Processes; and
- Increasing Public-Private Partnerships in the T&E Infrastructure

THE CHALLENGE

Declining defense budgets in the era of new, rapidly changing, and evolving threats have driven the Department of Defense to take a comprehensive look at how it can conduct its mission faster, better, and cheaper. This additional action is necessary even though, we have made significant long-term reforms in our acquisition processes and structures as well as significant reductions in the acquisition infrastructure.[1]

The T&E infrastructure has actively contributed to these reductions. Since the peak defense budget of 1985, the T&E infrastructure funding has been reduced about 35 percent, while the total acquisition infrastructure funding, including T&E, has been reduced about 18 percent. Since 1995, T&E and the total acquisition infrastructure funding have both been reduced about 15 percent.

The T&E professional government workforce at the MRTFB has declined by over 9,200 people, about 22 percent, between FY 1987 and FY 1999. Since FY1990, there has also been a 39-percent decrease in the number of military personnel within the MRTFB.[2]

Along with these reductions, the closures, consolidations, and realignments shown in Tables 16 and 17 have occurred.

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[1] DoD FYDP-based Infrastructure and Mission Categories Database.

[2] Major Range and Test Facility Base (MRTFB) Exhibit Tracking Database.

Table 16. T&E Closures

T&E Mission Closures
Jefferson Proving Ground, IN
Fort Hunter-Liggett, CA
Naval Air Propulsion Center, Trenton, NJ

Table 17. T&E Consolidations and Realignments

T&E Mission Consolidations and Realignments
Army restructured from nine Major Test Centers down to six: • Tropic Test Center and Cold Regions Test Center consolidated as Test Directorates under Yuma Proving Ground • Electronic Proving Ground consolidated as a Test Directorate under White Sands Missile Range
Army Operational Test and Evaluation Command formed by consolidating: • Operational Test and Evaluation Agency (OTEA) • Test and Experimentation Command (TEXCOM) • Operational Threat Support Activity (OTSA)
Navy consolidated technical activities into a combined RDT&E infrastructure: • 13 RDT&E sites closed • 27 RDT&E tenant activities closed • 34 Commands associated with Department of Navy technical efforts eliminated • RDT&E Center at White Oak, MD, closed and management of required assets consolidated under the Air Force's Arnold Engineering Development Center
Air Force reduced test aircraft inventory by 50 percent Air Force mothballed 50 test assets at 3 T&E Centers
Air Force consolidated test assets: • Dissolved 4950th Test Wing and consolidated residual assets at Edwards AFB • Disestablished Electromagnetic Test Environment (EMTE) and will consolidate required test assets at Edwards AFB • Closed REDCAP and will provide required test assets and necessary support equipment at Edwards AFB • Transferred management and mission of the Utah Test and Training Range to the Air Combat Command

Why Change?

As the DoD test community strives to accomplish its mission and contribute to the modernization program for future readiness, it faces the fundamental dilemma illustrated in Figure 2.

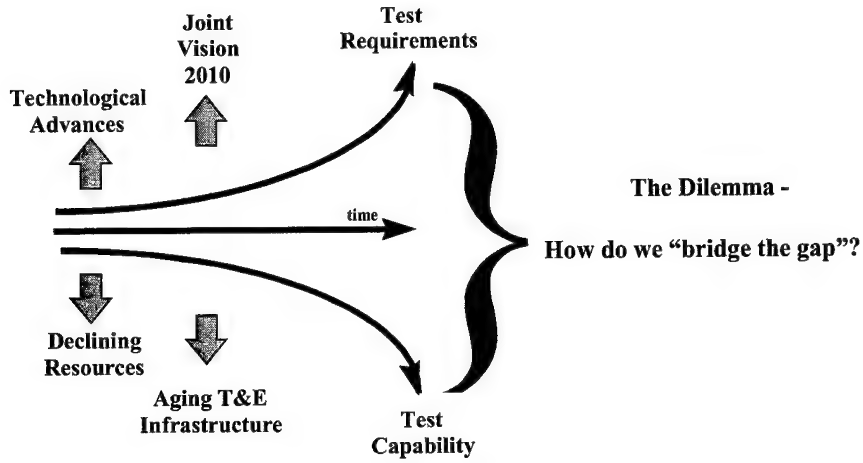

Figure 2. The T&E Management Dilemma

On one hand, the Department's strategy increasingly relies on the fielding of fewer, but more capable systems—systems that are inherently more sophisticated and complex—with greater technical challenges which stress our current test capabilities. Joint Vision 2010, the Department's conceptual template for achieving the required levels of effectiveness in joint warfighting, depends heavily on DoD's ability to leverage new and emerging technologies. T&E will continue to play a crucial role in the successful development and fielding of these new and emerging technologies and systems. As a result, the test community is facing increasingly greater demands for larger test areas, higher data rates, greater fidelity, increased efficiency, and greater flexibility. Unfortunately, this rapid rate of change is beginning to overwhelm the Department's test capabilities.

On the other hand, declining test investments have resulted in a decrease in current test capability, and in a dramatically reduced capability to respond to future testing needs. During the last 20 years, DoD's investment rate for T&E facilities has been less than one-third the rate of investment in private industry and an order of magnitude below the investment rate for high-technology industries. Military construction funding for the MRTFB is down 65 percent since 1990. Concurrently, investment funding is down by 39 percent since FY1990. Our current investment level equates to a replacement rate of 500 years compared to industry rates of 20 to 40 years. In real terms, this means that T&E facilities face declining availability and maintainability.

At the same time that test investments have been declining, facility maintenance costs have been increasing and productivity decreasing due to aged infrastructure and outdated technology. Over three fourths of the MRTFB infrastructure is more than 30 years old. Average age is almost 40 years old. These forces affect the acquisition programs in the following ways:

- Time to test is increased due to lower availability of older, more-difficult-to-maintain test capabilities, resulting in cycle time impacts on programs.
- Costs to test are increased because of the lack of adequate investment in the capabilities needed for emerging, cost-effective test methodologies.
- Risk in programs is increased as test and measurement capabilities lag the technologies being tested.

The impact on the warfighter is an increased risk that systems will be fielded that do not meet the warfighters' needs.

Given essentially no overall increase in defense spending, the only way to generate the necessary dollars to modernize the test infrastructure is to shift resources from the support and infrastructure area into the modernization area; and to do this while achieving equal, or preferably better, performance and responsiveness. Thus, it is more critical than ever that DoD eliminate the excess and unwarranted duplicative portions of our infrastructure and initiate a Revolution in Business Affairs that will free up the resources needed to invest in the recapitalization and modernization of our critical test capabilities.

Compounding this challenge is a management structure that is simply too complex and overburdened with too many boards and committees to function effectively. Simply put, the first step must be to streamline and integrate the Department's test management to ensure that the test community will be postured to meet the needs of the future and that it contributes its part to achieving a streamlined, responsive, affordable acquisition process for the 21st century.

The Strategy

If we are to have a test infrastructure that is both capable of satisfying the needs of the future and efficient in its operation, we must act now to institute a new framework for managing and operating these complex technical facilities. The basic elements of that new framework, described in the following sections of this report, include these actions:

- Form an integrated test management structure.
- Develop a strategic plan for the test infrastructure, including T&E investments.
- Redefine the Major Range and Test Facility Base (MRTFB).

- Issue a funding policy that supports the redefined MRTFB.
- Issue a DoD approach for public-private partnerships within the test infrastructure.
- Improve DoD test and business processes.

These actions, in combination, will provide a new framework for the test infrastructure of the 21st century.

INTEGRATED MANAGEMENT OF T&E INFRASTRUCTURE

Background

As part of the Defense Management Review Process in 1989, the Office of the Secretary of Defense (OSD) proposed an acquisition structure, to include T&E, independent from the Services' assets. The Services responded by planning and executing internal consolidation and efficiencies, and by creating a philosophy of reliance upon one another for the S&T and T&E areas. The T&E Reliance process fostered dependence by the Services on each other by establishing a lead Service for each of the identified functional T&E areas and associated capabilities. A principal goal of each of the Reliance Leads was to oversee the T&E investments in its functional area, identifying areas where duplication of investments was occurring, and to focus future investments in those capabilities best suited for the functional area.

The 1993 Roles and Missions Report for the Armed Forces of the United States recognized the accomplishments of the T&E Reliance process but indicated that more could be done regarding streamlining the T&E infrastructure. The report recommended that an Executive Agent be designated to streamline the T&E infrastructure and to electronically link test ranges and training ranges in broad geographical areas such as the southwestern United States. On April 15, 1993, the Secretary of Defense directed the Military Departments to comply with the recommendation, and placed this issue in the "Fast Track" category with a 90-day suspense. The Military Departments responded by establishing a tri-Service T&E Executive Agent on July 8, 1993. An interim charter for a Board of Directors (BoD) for the Executive Agent consisting of the Service Vice Chiefs of Staff was approved by the Secretaries of the Military Departments on August 12, 1993, and approved by the Under Secretary of Defense (Acquisition) on October 1, 1993. Interim charters for a Board of Operating Directors (BoOD) and Joint Program Office (JPO) for T&E were subsequently approved. The interim charter for the BoD was finalized by the Secretaries of the Military Departments and reissued on August 5, 1994. The BoD receives staff support from an Executive Secretariat, while the BoOD is the implementing body for policies, direction, and guidance from the BoD through the Military Department T&E principals.

The BoD mission is to ensure that modernization investments are made at test facilities and ranges best suited to support required testing without regard to Service ownership and to develop streamlining, consolidation, and downsizing initiatives for the T&E Infrastructure. The major responsibilities of the BoD include:

- Approving and committing the Military Departments' T&E resources to meet T&E infrastructure requirements.
- Approving and promulgating T&E infrastructure investment policy and guidance.
- Provide T&E infrastructure standards.
- Provide program review and advocacy support of T&E infrastructure to OSD and Congress.

Since T&E Reliance was to build upon the Military Departments' internal downsizing and obtain additional efficiencies by having them rely upon each other for execution of specific test functions and avoiding unnecessary duplication of investments and capabilities, the T&E Reliance process was subsumed into the BoD structure. The T&E Executive Agent led or was a major participant in subsequent studies aimed at streamlining the T&E infrastructure. This activity consisted of the following three efforts:

- The first chairman of the BoD directed in November 1993 that a T&E infrastructure streamlining study be conducted and the military services performed a set of streamlining studies. The results of this study were "tabled" by the BoD in recognition of the emergence of BRAC 95.
- In response to a congressional request in 1995, the BoD developed the Electronic Combat T&E Consolidation Master Plan for the Secretary of Defense, which provided a road map for streamlining the Military Departments' electronic combat T&E infrastructure.
- In response to section 277 of the NDAA for FY 1996, the Vision 21 study was initiated. The Vision 21 study plan centered on reducing, restructuring, and revitalization the Services' laboratories and T&E centers. The purpose was to support the requirement for development, test, and evaluation of current and future weapon systems and identify the critical laboratories and test centers needed to achieve them. Plans for the conduct of the Vision 21 study were completed and a report to Congress was delivered on May 1, 1996. The Vision 21 study was superceded, however, by section 912 in the NDAA for FY 1998 and this resulting effort.

BoD Initiatives

As part of this study, the members of the T&E Board of Directors participated as members of the Senior Steering Group, while the BoD Executive Secretariat and Staff participated in other working-level groups. In response to the USD(A&T), the BoD was requested to make recommendations toward addressing the objectives of the RDT&E Infrastructure Study from the T&E perspective. Of particular interest were recommendations that would result in a greater integration of the management of the T&E infrastructure.

The BoD made two recommendations in this area:

- Make OSD a full partner in the BoD and work towards developing an integrated management structure for T&E; and
- Identify potential T&E cross-service streamlining and consolidation actions for study.

The first recommendation would make the Director of Operational Test and Evaluation (DOT&E), a full member of the BoD, and work toward a goal of reducing or eliminating duplication between the Military Departments' and OSD's separate structures. Partnering between the Military Departments and OSD will allow more efficient management and oversight of T&E infrastructure and investments. As a result, by September 30, 1999, the T&E Executive Agent charter will be revised, and the T&E Executive Agent and DoD T&E Committee structure will be examined and streamlined to foster integration and improve the lines of communication.

In response to the second recommendation, the expanded BoD, by the close of 1999, will develop a plan that addresses streamlining and consolidation alternatives in the following areas: live-fire testing, warheads and fuzing, rotary-wing testing, electromagnetic pulse testing, joint electronic warfare testing, sled tracks, outdoor static radar cross-section measurement facilities, and wind tunnels.

For the integrated management approach to be successful, the T&E Executive Agent must be guided by a sense of the overall priorities for test investment funding, infrastructure funding, and the assignment of test workload. Therefore, in addition to the recommendations from the T&E BoD, the USD(A&T) has directed that two other initiatives will be considered during the review of the T&E management structure and the rechartering of the BoD.

- Consider a BoD review of all major new T&E investments (both for upgrades to existing facilities and for additional facilities);
- Consider a BoD review of all major decisions by acquisition programs regarding the location of testing and any acquisition program investments in new testing capabilities.

Under the existing T&E Executive Agent structure, all major new T&E investments made corporately by the Military Departments (both for upgrades and additions) are reviewed by the Board of Operating Directors (BoOD) and approved by the BoD. Once the applicable T&E Executive Agent charters are updated to reflect the addition of the OSD representation, this process will be modified to include all major corporate investments.

Major investments made by acquisition programs and other major program decisions are under the purview of the Component Acquisition Executives. Any new policy of guidance pertaining to these investments will be done jointly with the acquisition community.

Develop a DoD Test Resources Master Plan for the Test Infrastructure

A single vision for the test infrastructure is necessary to provide the focus and direction to unify the disparate elements that are called together to form the test infrastructure. Instead of waiting until the needs of acquisition programs become apparent, a visionary long-term view of the test infrastructure will be prepared to form the basis for developing and implementing the infrastructure that is needed to test future DoD systems. The timeline for large capital investments in the test infrastructure is such that when an acquisition program identifies the need for a major new capability, it is already too late to plan, seek funding, and build the capability within the schedule of the acquisition program. Therefore, there must be another process that will highlight these "visionary" needs with sufficient lead-time so the needs can be reviewed, approved, funded, and implemented before the need becomes a requirement for a specific acquisition program.

To aid in the "integrated" view of the test infrastructure and the planned evolution of that infrastructure to meet the needs of the Department, a DoD T&E Resources Master Plan will be developed to provide a long-range strategic plan and a business plan incorporating a multi-year investment road map. The long-range strategic plan will state the major goals and objectives for the infrastructure and outline planned actions to meet those goals and objectives. The business plan will be a more detailed statement of the detailed activities that are planned in support of the long-range strategic plan.

Specifically, the following will be included regarding long-range strategic planning:

- Goals — state the longer-term (5 to 10 years and beyond, if possible) goals of the Department
- Objectives — state the shorter-term (3 to 5 years) objectives of the Department that will lead to the achievement of the goals

- Responsibilities — state the responsibilities of the various organizations within the Department in achieving the objectives and goals. These organizations will include the T&E elements of the OSD staff, the Military Departments, the T&E center directors/commanders, and the T&E Board of Operating Directors.

- Schedule — include a schedule that will outline the planned dates for completing activities and for meeting the stated objectives.

- Resources — include a list of the resources (personnel and funding) that are projected to be available to meet the needs and requirements of the T&E infrastructure.

Business planning will include:

- Detailed sequence of activities related to each of the Long Range Strategic Plan Objectives

- Detailed schedule for investments to achieve the shorter-term investment requirements.

The first issuance of the Master Plan will be in time to support the FY2002 Program Objective Memorandum (POM) and updated and completed every two years in conjunction with the Department's preparation of the POM. The investment planning portion of the Master Plan will be used to satisfy the test investment portion of the Joint Test and Training Range Roadmap (JTTRR) as required by the USD(A&T) policy on the JTTRR Investment Policy.[3]

RECOMPOSITION OF THE MAJOR RANGE AND TEST FACILITY BASE (MRTFB)

The MRTFB was initially established in 1972 to ensure that requisite DoD test capabilities would be available when needed by any DoD Component responsible for developing or operating materiel and weapon systems. DoD Directive 3200.11[4] defines the MRTFB as a national asset that shall be sized, operated, and maintained primarily for DoD T&E support missions and consisting of a broad base of T&E activities managed and operated under uniform guidelines.

Originally the MRTFB designation was by site. Over the years, the MRTFB activities have evolved to meet individual Component needs. This evolution has occurred relatively independently with different reporting chains, priorities, business and funding practices, technical capabilities, investment strategies, and processes, and the four BRAC rounds. The net result is that the current set of 21

[3] USD(A&T) Memorandum, *Joint Test and Training Range Roadmap Investment Policy*, March 2, 1999.

[4] DoD Directive 3200.11, *Major Range and Test Facility Base (MRTFB)*, January 26, 1998.

MRTFB activities represents a non-homogeneous mix of organizations. The composition of the MRTFB requires updating to ensure that those core capabilities and facilities required to meet the Department's testing needs of the 21st century are properly identified and retained.

The fundamental goal in redefining the MRTFB is to ensure these future requirements can be met through the identification and retention of those facilities and capabilities embodying the critical air/land/sea/space (adequate in size to test current and future weapon systems under realistic footprints and tactics) and core test capabilities required to support future development and acquisition programs. Therefore, the Director, Test, Systems Engineering and Evaluation, requested the T&E Board of Directors Executive Secretary (BoDES) to develop a list of T&E facilities by June 30, 1999, which, when added to the open air test ranges, could be considered the national assets that must be sustained in order to conduct the DoD's test mission. The underlying assumptions included:

- At any point in time there may be additional facilities which the Department finds prudent to sustain because of workload, geographical factors, and other business case rationale.
- Such a list must be periodically reviewed as the Department's requirements will change over time.

Review of the MRTFB will be part of each two-year master planning cycle and will ensure its ability to meet evolving future requirements and to avoid unwarranted retention of obsolete assets or unwarranted duplication. In this regard, these reviews will give full consideration to the use of these assets by non-DoD agencies and by DoD activities for such other activities as testing and research and development. Interim direction on recomposition of the MRTFB will be issued by February 2000.

A FUNDING POLICY THAT SUPPORTS THE REDEFINED MRTFB

Concurrent with the redefinition of the MRTFB, the Department undertook a review of the existing MRTFB funding policies. The purpose of the review was to determine (a) whether these policies continue to meet their goals and (b) whether they ensure required test capabilities will be available when needed to provide T&E information to DoD decision makers and to support the T&E needs of DoD weapon system development and research programs.

The existing MRTFB funding policy is documented in DoD Regulation 7000.14-R, "Financial Management Regulation" and DoD Directive 3200.11, "Major Range and Test Facility Base (MRTFB)." This policy requires the user to fund all direct costs associated with the provision of test services by an MRTFB activity. The owning Component institutionally funds the indirect costs. The fundamental

goals of the existing policy are to promote the most effective development and testing of materiel; and to encourage more inter-Service and joint use of the MRTFB through provisions that ensure inter-Service compatibility, efficiency, and equity without influencing technical testing decisions or inhibiting legitimate and valid testing. These goals remain valid today. However, the following recommendations are consistent with the intent of DoD Directive 3200.11 but may be more relevant in today's environment.

A "tiered" but uniform funding policy is being evaluated that would allow for a range of options for full cost recovery to institutional funding of indirect costs as appropriate for each facility and open air range in the MRTFB. The results of this evaluation will be presented to the BoD and the OSD Comptroller by October 1, 1999 for review and approval. Any implementation of this policy would require a periodic, specified review process to determine that MRTFB facilities and capabilities were appropriately categorized in the tier relevant to their ability to attain full cost recovery.

The Department's review also found that while the existing MRTFB funding policies are basically sound and capable of meeting the above stated goals, there are some deficiencies in existing practices.

First, there has been inadequate assurance that those national assets in the MRTFB with low levels of utilization would be funded to a level adequate to ensure their retention and availability to support future testing requirements, especially if the primary customers are not from the owning Service or Defense Agency. To address this deficiency, existing policies must be enforced to require the owning Service or Defense Agency for each "national asset" to program sufficient funds to ensure their sustainment and availability for satisfying the critical test requirements of any DoD activity.

Secondly, as the Department has drawn down, institutionally-funded, non-T&E activities have been competing for test workload to increase the utilization levels of their facilities. This activity can result in the sustainment of unnecessary duplicative capabilities and users obtaining test services from non-MRTFB activities simply because that non-MRTFB activity can provide the required test services at a lower cost to their program. The institutionally-funded activity can simply charge a lower amount because it is able to cover some or all of the direct costs with its direct appropriation. This can lead to an overall increase in total cost of testing to the Department. To resolve this deficiency, existing funding policies will be reviewed by the Defense Test and Training Steering Group (DTTSG). The review will be completed by April 1, 2000 and determine if non-MRTFB DoD providers of test services should charge the test user all direct costs for those services, as is the current policy for the MRTFB activities.

PUBLIC-PRIVATE PARTNERSHIPS

As a part of the development of this plan to streamline DoD's RDT&E infrastructure, a joint government and National Defense Industrial Association (NDIA) working group was formed in December 1998 to identify, evaluate, and recommend public-private partnership options for reducing the total cost of operating, sustaining, and modernizing the T&E infrastructure. A second task was to create a standing forum for the routine exchange of planning and investment information between government and DoD.[5]

The working group was unanimous in its conclusion that privatization of the MRTFB was not practical where privatization is defined as complete and total conveyance of all test resources to private industry. Moreover, the DoD cannot sell what it does not own, i.e., withdrawn land areas, and industry is not interested in ownership due to the condition of the assets and the perceived lack of commercial viability.

The concept of a government corporation to manage a set of national test assets was rejected by industry. Although industry faces many of the same issues as the DoD with respect to over-capacity in test facilities, they can take the necessary actions to eliminate the excess. Industry did not see how turning that job over to a Government Corporation could be of any benefit to them. Therefore, a government corporation did not appear financially attractive to industry.

The concept of selective privatization (conveyance of ownership of selected assets to industry with industry assuming responsibility for all pre-existing conditions except environmental liability) was considered worthy of further consideration. Development of potential candidates was outside the scope of the study but both government and industry were interested in further assessments on a case-by-case basis.

The major conclusion of the study was that public-private partnership in the T&E environment can best be achieved through the Government Owned, Contractor Operated Plus (GOCO+) or Arnold Engineering Development Center (AEDC) organizational models. GOCO+ is defined as a variant of GOCO where the contractor is able to market unused capacity to non-DoD markets and a profit sharing to contribute to asset recapitalization. The AEDC Model is a variant of GOCO where the government maintains an active role in day-to-day operations and retains enough presence and in-house expertise to ensure it acts as an informed buyer. It is patterned after the current operation at AEDC.

The study found that the appropriate contractual vehicle for achieving a balance between low cost to government and adequate profit for industry is one which

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[5] The report of the working group and its study efforts has been separately published in a NDIA-DoD document, *Test and Evaluation Public-Private Partnership Study, Final Report*, February 16, 1999.

- is performance-based;
- contracts for services rather than operations and maintenance of assets;
- allows excess capacity to be marketed and sold for profit, and rewards and fosters efficiency by allowing the contractor to keep savings; and
- provides for sharing of recapitalization costs.

In order to allow amortization of capital investments, the contract needs to be long-term. Contractor performance should be measured against a set of defined metrics. And, industry believes it could provide the required performance with a hybrid contract structure that uses fixed pricing for routine products and services and cost plus for those products and services driven by dynamic mission/customer requirements. Such a contract would incentivize the contractor to be efficient while providing the government with a relatively stable budget requirement.

The joint government and industry working group recommended that the Department aggressively pursue migration to the GOCO+ or AEDC model where those models would provide significant benefit. Required enablers must be identified. The group further recommended that the use of the A-76 process would not be effective in achieving the goal of increased public-private partnership and that DoD should use its waiver and exemption authority to the maximum extent permissible.

In studying the idea of consolidated range contracts, the BoD will address implementation of the various approaches across all regions and to the maximum number of applicable sites in each region. They believe the greatest potential for tri-Service consolidation of contracts is in range technical support areas.

With respect to the second tasking, the Air Force has taken the lead for DoD. The initial step will be a senior-level, tri-service-industry forum, co-hosted by DoD and NDIA, to initiate the dialog by September 1, 1999. The activity under this task is continuing and is expected to take about a year to complete.

FORMING A WESTERN TEST RANGE

As a near-term action to implement the set of T&E initiatives addressed in this study, the USD(A&T) has tasked the T&E Board of Directors to consider the formation of a Western Test Range Command (WTRC). Implementation of such a Command would be considered as a prototype for a concept of the future operation of the MRTFB. It could be created in place and include all or a subset of the following T&E centers: Air Force Flight Test Center, Naval Air Warfare Center-Weapons Division, Yuma Proving Ground, Nellis Ranges, Utah Test and Training Range, White Sands Missile Range, and the Electronic Proving Ground.

Creation of a WTRC might proceed, as follows: A headquarters site and initial commander would be selected. The commander, who would rotate between military services and be provided with sufficient guidance and control of resources to implement and execute transition to a command structure. The Command concept would include appropriate consolidation of management functions, long-range strategic and investment planning, and migration to the kind of effective public-private partnership described above. This would specifically include instituting over a period of time a single contract, or set of contracts, for the Command as recommended by the government-industry study.

The T&E Board of Directors will respond to the USD(A&T) by October 1, 1999.

IMPROVING TEST PROCESSES

In May 1998, the USD(A&T) chartered a Defense Science Board (DSB) task force on Integrated T&E. The tasking for this task force included the following:

> Your study should include an examination of new and innovative ways that the T&E community can better support these users.… There are a number of test processes that merit thoughtful review in light of these new demands and the new technologies with which they are associated. Major advances can be realized by applying selected industrial principles and practices to operational testing and the associated information gathering and evaluation process in the development of military systems.[6]

The DSB Task Force is now completing its work and the report on its activities and recommendations will be published in May 1999.

[6] USD(A&T) Memorandum to the Chairman, Defense Science Board, *Terms of Reference—Defense Science Board Task Force on Test and Evaluation*, May 18, 1998.

Chapter 5
Cost-Based Management Tool (CBMT)

INTRODUCTION

A central activity of the section 912(c) study group effort was development and implementation of the Cost-Based Management Tool (CBMT) to establish the true costs of doing business for the Department's laboratories and T&E centers.

CONSTRUCT OF THE CBMT

The CBMT was developed by DDR&E(LM&TT), DTSE&E, and the Military Departments. It is an executive-level database designed to address issues of full cost visibility and comparability across DoD laboratories and test centers. The CBMT database structure, shown in Figure 3, organizes cost and resource information along three basic axes: an *organizational* axis, a resource or *cost element* axis, and a high level *workload* axis that links cost data to states of development life-cycle (e.g., basic research, applied research, advanced technology development, etc.) in each of several product areas.

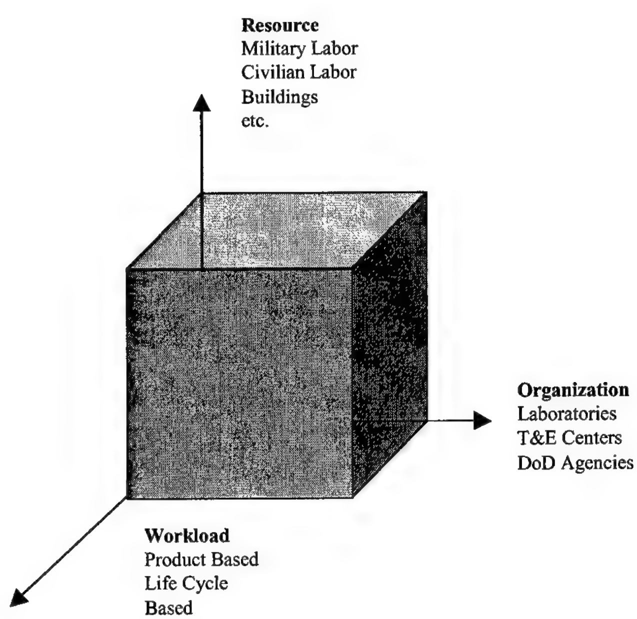

Figure 3. CBMT Database Structure

The CBMT provides a database structure for cost and resource information provided by individual laboratories and test centers. Cost data is further broken down into a number of technical and support workload categories.

The CBMT is designed for two related purposes. The first is in direct support of the requirements of sections 912/907 to develop and deploy a cost based management information system to establish a baseline for infrastructure savings. The second is for ongoing oversight of the RDT&E enterprise by the DoD.

RESULTS

Table 16 indicates the total operations costs of the Department's labs and test centers as presently defined. This qualification is intended to highlight the fact that the Navy "laboratories" have a broader mission than those of the Army and Air Force, as review of the charts below will indicate.

Table 16. Summary of Operations Costs for FY1996 ($K)

	Army	Navy	Air Force	Defense Org's	Total
Technical	3,767,092	7,732,167	3,235,058	129,912	14,863,629
Support	936,746	1,725,853	993,142	55,496	3,711,237
Capital Expenses	120,377	250,351	87,598	381	458,707
Total	4,824,215	9,708,371	4,315,798	185,789	19,033,573

Notes:

a. Technical Costs are comprised of Military Labor (3.1), Civilian Labor (3.2), Travel (3.3), Contractor Support (3.4), Other Government Services (3.5), and Minor Equipment, Materials and Supplies (3.6).

b. Includes technical work performed at DoD laboratories as well as that performed at contractor facilities.

c. Support Costs are comprised of Military Labor (3.1), Civilian Labor (3.2), Travel (3.3), Contractor Support (3.4), Other Government Services (3.5), and Minor Equipment, Materials and Supplies (3.6) Reported in Command Management/Administration, Facilities Support, Financial Management, Human Resources, Contracts Administration, Supply Support, C2 Data Systems, Military Support Activities, and Other Support plus the total cost of Common-Level Base Operating Support* (3.7), Incremental Level Base Operating Support (3.8), Land Use (3.10), Leased Buildings (3.12), and Leased Capital Equipment (3.14).

d. Respondents are either hosts or tenants. If a respondent is a host (e.g., it is responsible for base operations and other organizations reside on the base), BOS is negative to indicate the amount of support that a host provides tenants. If a respondent is a tenant, BOS is positive, to indicate the amount of support that a respondent receives.

Table 16 displays total operations costs of about $19 billion, comprising $14.9 billion for technical costs, $3.7 billion for support costs or infrastructure, and $459 million for new investment in plant and equipment, using a baseline of Sep-

tember 30, 1996. Table 17 displays total costs as percentages for each of the Military Services and for the Defense Agencies.

Table 17. Summarized Costs (as Percentages for each Service and the Defense Agencies)

	Army	Navy	Air Force	Defense Org's	Total
Technical	78.1%	79.6%	75.0%	66.3%	78.1%
Support	19.4%	17.8%	23.0%	33.5%	19.5%
Capital Expense	2.5%	2.6%	2.0%	0.2%	2.4%

Table 18 displays technical costs by acquisition lifecycle, including Procurement and Operations and Maintenance (O&M). This table indicates a Navy effort approximately twice that for the Army and Air Force. The majority of this difference resides in the procurement and O&M categories, reflecting the role assigned to the Navy laboratories (Warfare Centers/Systems Centers) under the Navy's "cradle to grave" acquisition philosophy. Comparison of the Program 6 categories, Research, Development, Test and Evaluation, strictly speaking, indicates more comparable efforts. The Air Force effort in demonstration and validation is modest, because systems engineering activities in electronics and space are performed by Federally Funded Research and Development Centers, whose activities are not captured by the CBMT. The limited Air Force funding of Operational Systems Development reflects an allocation of resources to Initial Operational Test and Evaluation.

Table 19 displays technical costs according to a product taxonomy. The major areas of common interest and similar facilities across the Military Departments are Air Systems, Armaments and Munitions, and C4I. The large technical effort in Land Systems and Sea Systems by the Army and Navy, respectively, are, of course, singular. The table also reflects a difference in philosophy related to Corporate Technology. The Air Force chose to distribute most of the technical efforts of the Air Force Research Laboratory across the rest of the product taxonomy. The Army Research Laboratory and Naval Research Laboratory chose to book their costs under Corporate Technology, reflecting a concern that these labs not lose their identity under the CBMT. Issues such as these will be addressed before the next deployment of the CBMT in 2000, to collect data for FY1999.

Table 18. Technical Costs by Life Cycle Taxonomy for FY1996 ($K)

Life Cycle Taxonomy	Army	Navy	Air Force	Defense Org's	Total
Basic Research	159,749	108,714	133,875	—	402,338
Applied Research	879,971	433,354	557,877	21,995	1,893,197
Advance Technical Development	960,693	470,176	557,137	13,543	2,001,549
Demonstration and Validation	264,946	621,212	66,159	1,274	953,591
Engineering and Manufacturing Development	271,786	917,980	941,166	6,445	2,137,377
RDT&E Management Support	237,932	305,474	450,404	10,491	1,004,301
Operational Systems Development	152,864	481,803	36,033	1,741	672,441
Procurement	439,372	2,054,473	73,404	—	2,567,249
O&M	316,603	1,466,489	196,352	524	1,979,968
Other	83,176	872,492	222,651	53,899	1,251,618
Total	3,767,092	7,732,167	3,235,058	109,912	14,863,629

Notes: Lifecycle Taxonomy Technical Costs are comprised of Military Labor (3.1), Civilian Labor (3.2), Travel (3.3), Contractor Support (3.4), Other Government Services (3.5), and Minor Equipment, Materials and Supplies (3.6).

Table 19. Technical Costs by Product Taxonomy for FY1996 ($K)

Product Taxonomy	Army	Navy	Air Force	Defense Org's	Total
Air Systems	151,614	1,301,739	1,237,664	—	2,691,017
Armament/Munitions	1,449,846	1,182,864	391,533	—	3,024,243
C4I	567,446	1,118,500	710,686	41,800	2,438,432
Corporate Technology	762,150	709,069	18,365	4,285	1,493,869
Electronic Combat	44,628	204,837	73,355	—	322,820
Land Systems	441,774	19,629	157	—	461,560
Other Technical	326,455	617,847	118,149	63,827	1,145,678
Sea Systems	6,046	2,459,341	13	—	2,465,400
Space Systems	17,133	118,341	685,136	—	820,610
Total	3,767,092	7,732,167	3,235,058	109,912	14,863,629

Note: Product Taxonomy Technical Costs are: Military Labor (3.1), Civilian Labor (3.2), Travel (3.3), Contractor Support (3.4), Other Government Services (3.5), and Minor Equipment, Materials & Supplies (3.6) as reported in each taxonomy.

Table 20 shows the support costs, by support taxonomy area, of the laboratories and test centers, which total $3.7 billion. The metrics of the section 912(c) charter call for these costs to be reduced by 10 percent by FY2001 and 25 percent by FY2005. These metrics amount to about a 3 percent increase in productive ratio per year, a goal consistent with that achieved in commercial industry.

Table 20. Support Costs by Support Taxonomy for FY1996 ($K)

Support Taxonomy	Army	Navy	Air Force	Defense Org's	Total
Command Management and Administration	**172,558**	**446,968**	**370,511**	**8,642**	**998,679**
Facilities Support	**278,537**	**468,616**	**166,300**	**15,595**	**929,048**
Financial Management	**48,174**	**111,577**	**35,927**	**1,003**	**196,681**
Human Resources	**29,736**	**84,804**	**19,638**	**317**	**134,495**
Contracts Administration	**37,740**	**87,915**	**44,822**	**3,971**	**174,448**
Supply Support	**77,455**	**98,857**	**29,845**	**541**	**206,698**
C2 Data Systems	**60,249**	**243,936**	**59,503**	**19,723**	**383,411**
Military Support Activities	**11,372**	**59,458**	**25,319**	—	**96,149**
Other Support	**76,618**	**208,366**	**231,732**	**2,633**	**519,349**
Base Operating Support	**118,816**	**(120,609)**	**(2,797)**	**3,021**	**(1,569)**
Land Use	**15,923**	**15,333**	**7,640**	**2**	**38,898**
Leased Buildings	**8,210**	**13,390**	**219**	—	**21,819**
Leased Capital Equipment	**1,358**	**7,242**	**4,483**	**48**	**13,131**
Total	**936,746**	**1,725,853**	**993,142**	**55,496**	**3,711,237**

Notes:

a. Support Costs are comprised of: Military Labor (3.1), Civilian Labor (3.2), Travel (3.3), Contractor Support (3.4), Other Government Services (3.5), and Minor Equipment, Materials and Supplies (3.6) Reported in Command Management/Administration, Facilities Support, Financial Management, Human Resources, Contracts Administration, Supply Support, C2 Data Systems, Military Support Activities, and Other Support plus the total cost of Common-Level Base Operating Support (3.7), Incremental-Level Base Operating Support *(3.8), Land Use (3.10), Leased Buildings (3.12), and Leased Capital Equipment (3.14).

b. Respondents are either hosts or tenants. If a respondent is a host (e.g., it is responsible for base operations and other organizations reside on the base), BOS is negative to indicate the amount of support that a host provides tenants. If a respondent is a tenant, BOS is positive, to indicate the amount of support that a respondent receives. A negative BOS indicates that more BOS is provided than received when all of a particular service's responses are aggregated

Table 21 lists in-house technical and out-of-house technical costs for comparison. The in-house portion of technical work is also shown and ranges from 33 percent for the Air Force, to 50 percent for the Army, and 57 percent for the Navy. On average, about half of the technical program executed by the laboratories and test centers is in-house.

Table 21. In House Technical Costs Versus Total Technical Costs for FY1996 ($K)

	Army	Navy	Air Force	Defense Org's	Total
In-House Technical	1,895,315	4,413,696	1,072,911	30,327	7,412,249
Out-of-House Technical	1,871,777	3,318,471	2,162,147	79,585	7,451,380
In-House Portion	50%	57%	33%	23%	50%

Table 22 displays in-house technical costs distributed among elements of the product taxonomy. The Navy costs, again, are the largest, reflecting a significant technical effort in Sea Systems and, as noted above, a larger contribution of procurement and O&M activities.

Table 22. In House Technical Costs by Product Taxonomy for FY1996 ($K)

Product Taxonomy	Army	Navy	Air Force	Defense Org's	Total
Air Systems	99,822	768,617	519,547	—	1,387,986
Armament/Munitions	625,617	827,573	149,856	—	1,603,046
C4I	196,160	634,999	118,347	10,484	959,990
Electronic Combat	27,698	125,320	38,980	—	191,998
Land Systems	358,143	17,123	157	—	375,423
Sea Systems	4,382	1,324,057	13	—	1,328,452
Space Systems	8,916	37,814	155,858	—	202,588
Corporate Technology	483,030	339,973	6,036	4,222	833,261
Other Technical Work	91,547	338,220	84,117	15,621	529,505
Total	1,895,315	4,413,696	1,072,911	30,327	7,412,249

Table 23 displays work-year analysis for civilians, military and contractors employed by the Department's laboratories and test and evaluation centers. Cost for in-house work years is computed by adding in-house technical cost and in-house support, subtracting contract management cost, and dividing by in-house direct technical work years. A factor in the lower in-house cost per work year for the Air Force is the more extensive use of enlisted personnel in their T&E facilities. Cost for a contractor work year is computed by adding total contractor technical costs and contract management cost, and dividing by contractor work years. The latter calculation recognizes the total "real" cost of outsourcing, which includes the cost of contract management. Given the drive to outsource an increasing fraction of the Department's technical program, the cost of a contractor workyear

vice that of an in-house workyear is an important benchmark. However, there is no existing data base which captures contractor workyears, so the workyear data in Table 23 are estimates and thus, the comparison of workyear rates is approximate at best.

Table 23. Work-Year Analysis for Civilians, Military, and Contractors for FY1996

	Army	Navy	Air Force	Defense Org's
In House Direct (Technical) Work Years	17,613	36,436	13,342	265
In-House Cost per Work Year ($K)	145.92	151.89	118.51	202.87
Contract Direct (Technical) Work Years	12,528	33,060	17,933	637
Contract Cost per Work Year ($K)	150.05	101.03	121.77	129.16

Table 24 shows the productive ratios for in-house staff (military and civil servants) calculated as the ratio of direct project work years (WY) to total work years, which include work in overhead functions. The ratio across the Department is 65 percent and, given that it is averaged across facilities with rather different missions, it is remarkably similar for the three military departments. These data indicate that across-the-board personnel cuts typically cut two project engineers for each support person. Insofar as they are not replaced by contractors, each reduction of support personnel increases the efficiency of the labs/centers. This was the goal of the 907/912(c) effort. Reductions of direct project personnel lead to an increase in the out-house/in-house ratio, but if that technical work is outsourced no net savings result. Reductions of direct personnel result in real savings insofar as their work was discontinued completely.

Table 24. In-House Productive Ratios for In House Staff for FY1996

	Army	Navy	Air Force	Defense Org's	Total
In-House Technical Work Years	17,613	36,436	13,342	265	67,656
In-House Total Work Years	26,830	55,704	20,818	549	103,901
Ratio	66%	65%	64%	48%	65%

Figure 4 shows a plot of support cost versus total technical costs and Figure 5 shows a plot of support costs versus in-house technical costs.

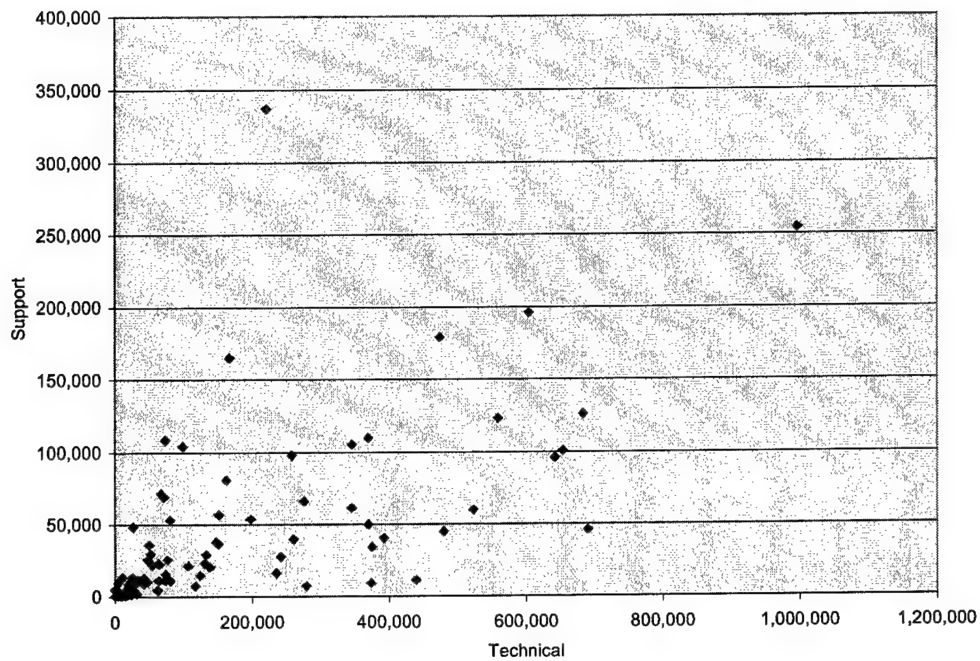

Figure 4. Total Support Costs Versus Total Technical Costs for FY1996 ($K)

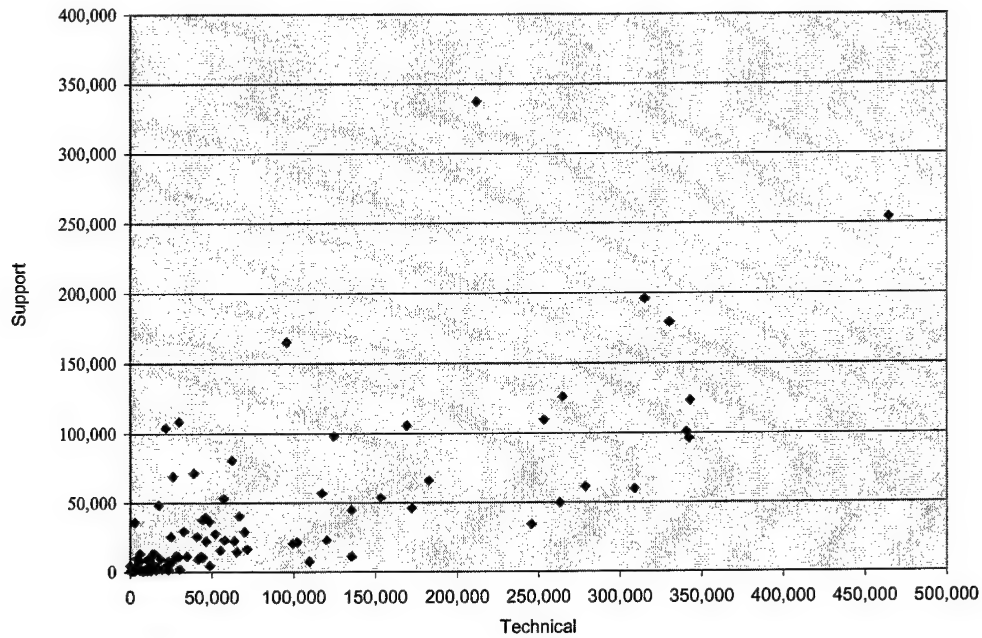

Figure 5. Support Costs Versus In-House Technical Costs for FY1996 ($K)

In general, support costs increase with an increasing level of technical effort. Support costs appear not to asymptote, however, demonstrating no economy of scale. However, these charts reflect the variability of reporting sites. Analysis of these data to identify best practices will help less-efficient laboratories and centers improve their performance. It is also noted that those sites reporting exceptionally low support costs may have misunderstood the CBMT guidelines, in which case the support costs reported in the previous tables may be understated. Resolving these issues will be part of the ongoing effort to institutionalize the CBMT.

Figure 6 plots support costs per direct work year versus total direct work years. This provides one measure of overhead. For organizations with greater than 1000 direct work years, support costs center on a band of about $20K to $40K per work year. A number of smaller organizations experience significantly larger "overhead" rates, associated with spreading fixed costs over a smaller workload.

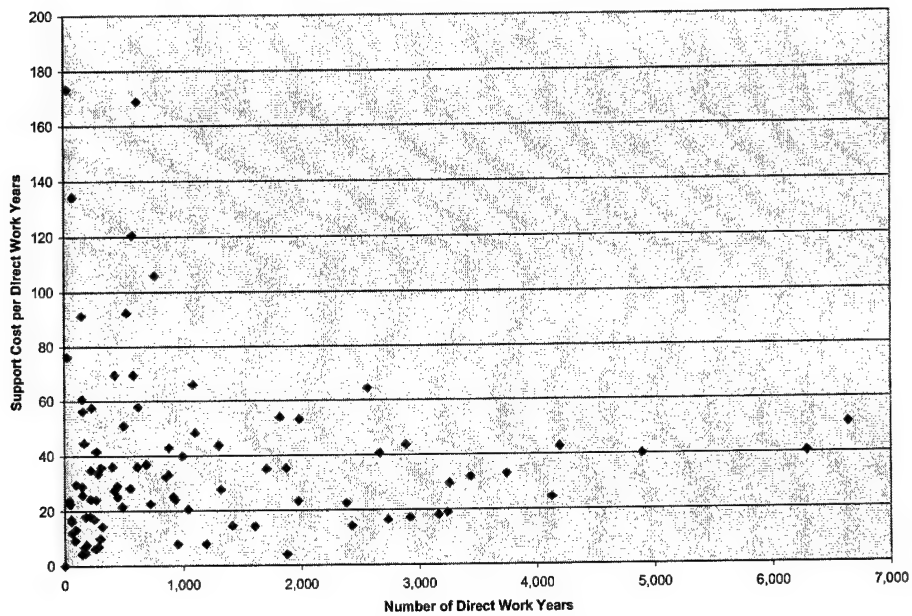

Figure 6. Support Cost per Direct Work Year ($K) versus Total Direct Work Years for FY1996

Note: Direct work years are the sum of direct civilian work years, direct military work years, and on-site contractor work years.

Table 25 shows the capital assets of the laboratories and centers. This includes, for example, for the Air Force, all test and support aircraft. Table 26 indicates the associated building space.

Table 25. Government Owned Capital Equipment ($K)

	Army	Navy	Air Force	Defense Org's	Total
Buildings	2,241,660	2,959,340	2,530,032	128,262	7,859,294
Capital Equipment	2,622,725	9,191,407	8,526,855	86,523	20,427,510
Total	4,864,385	12,150,747	11,056,887	214,785	28,286,804

Table 26. Building Condition and Usage for FY1996 (K square feet)

Building Condition	Army	Navy	Air Force	Defense Org's	Total
Standard	18,211	40,093	9,955	996	143,680
Sub-Standard	7,818	6,833	10,648	1	25,300
Inadequate	1,705	1,422	1,576	—	4,703
Total	27,734	48,348	22,179	997	173,683
Building Usage					
Administrative	5,839	4,824	2,437	272	23,047
Laboratory	14,133	20,992	10,924	119	110,918
Other	11,876	22,669	8,747	606	43,898
Total	31,848	48,485	22,108	997	177,863

Note: Totals differ due to different data systems used to collect building usage and building condition.

Table 27 indicates the investment in new plant and equipment in the labs and centers in 1996.

Table 27. New Capital Equipment and Construction for FY1996 ($K)

	Army	Navy	Air Force	Defense Org's	Total
New Capital Equipment	53,647	204,073	17,379	381	275,480
Military Construction	66,421	46,278	70,219	—	182,918
Total	120,068	250,351	87,598	381	458,398

Comparison of Tables 25 and 27 indicates an aggregate renewal rate for the laboratories and centers of over 50 years, which is poor by commercial standards.

Chapter 6
Conclusions

This review has been just the latest in the DoD's continuing efforts to maintain, at the least cost, the complex R&D infrastructure so necessary to maintain national security superiority, while resources are being severely reduced. In the first Secretary of Defense report to the Congress in 1948, the first Secretary emphasized the critical need for research and development, but noted that the DoD must avoid unnecessary duplication. During those early days, the DoD was creating much of the R&D capability that exists today and SECDEF reports since that time have reaffirmed the critically of RDT&E activities, and the need for them to be as efficient and capable as possible.

Implementation of the actions developed through the intra-Service/Agency and cross-service studies is expected to further improve the cost-effectiveness of the RDT&E infrastructure. With implementation, they will free resources for investment in technical or weapons programs or for other needs of the Department, while maintaining the capability of the RDT&E infrastructure to fully support the DoD's acquisition programs in the future.

This review identified a number of initiatives that relate specifically to the T&E infrastructure. One of these relates to refinements to the composition and financial procedures for the Major Range and Test Facility Base (MRTFB). Another involves increased participation in public-private partnerships. Finally, the T&E Executive Agent structure will be strengthened by inclusion of a senior member of the OSD staff, the DOT&E.

Finally, as part of this study, the CBMT was used to develop an approach to cost visibility for the RDT&E infrastructure to assist managers in their ongoing efforts to streamline management and reduce the cost of these activities, while preserving the necessary capabilities to support our weapons programs.

Table 28 is a summary of implementation actions that have resulted from this review.

Table 28. Implementation Actions

Category	Action	Responsible Organization	Time
Intra-Service Plans	Identify specific actions to accomplish stated savings	Army	Dec 1999
	Determine and complete schedule for implementation	Army	May 2000
	Complete identification of specific infrastructure transfers, divestitures, and savings from aeronautical, air armament, space and missiles, and command and control initiatives	Air Force	May 2000
	Implement management efficiencies	Navy	Sep 2000
	Implement actions to accomplish 10 percent savings	Army, Navy, Air Force	Sep 2000
	Complete work on implementation plans to consolidate, migrate or curtail items	Navy	Sep 2001
	Complete competitive sourcing initiatives	Navy	Sep 2003
	Complete cooperative arrangements and innovative leasing	Navy	Sep. 2004
	Complete actions as a result of aeronautical, air armament, space and missiles, and command and control initiatives	Air Force	Sep 2004
	Complete implementation of actions to accomplish 25 percent savings	Army, Navy, Air Force	Sep 2004
Intra-Organization Plans	Complete DTRA initiatives	DTRA	Sep 2004
	Complete JITC initiatives	JITC	Sep 2004
	Complete BMDO initiatives	BMDO	Sep 2004
	Complete OTD initiatives	OTD	Sep 2004
	Complete AFRRI initiatives	AFRRI	Sep 2004

Category	Action	Responsible Organization	Time
Cross-Servicing	Review all Sector panels results and identify actions to be taken to implement; estimate savings for all that are approved; combine with items from Service/Agency intra-Service/Agency plans that are cross-service proposals.	BoD, Army, Navy, Air Force	Dec 1999
	Identify all actions necessary to implement all sector panel recommends that have been approved as well as those in service intra-Service plans	BoD, Army, Navy, Air Force	May 2000
	Complete all approved cross-service actions	BoD, Army, Navy, Air Force	Sep 2004
T&E Initiatives	Provide a National Assets list for test facilities and capabilities to the BoD and DOT&E	BoDES	June 1999
	Revise and reissue charter for re-structuring of BoD T&E Executive Agent Structure	USD(A&T), BoD	Sep 1999
	Review tiered but uniform MRTFB funding policy and determine required revisions	USD(A&T), BoD, OSD Comptroller	Oct 1999
	Complete analysis of proposals for cross-servicing initiatives proposed by BoD and define a plan for consolidation and streamlining actions	BoD	Dec 1999
	Complete interim direction for re-composition of MRTFB	USD(A&T), DOT&E	Feb 2000
	Review existing funding policy for non-MRTFB activities and determine if policy revisions are required	DTTSG	Apr 2000
	Host a senior-level, tri-service-industry forum	Air Force	Oct 2000
	Reissue DoD Directive 3200.11 and issue an interim change to DoD 7000.14-R to include all changes	DEPSECDEF, USD(A&T), DOT&E, OSD Comptroller	Sep 2000

Category	Action	Responsible Organization	Time
Cost-Based Management (CBMT)	Identify alternative sources of data and refine data definitions	USD(A&T), DOT&E, Services	Dec 1999
	Identify data justified for management use and ensure other reports are not duplicates and are complementary	USD(A&T), DOT&E, Services	Dec 1999
	Issue data call for revised CBMT 1999 data to be provided by April 2000	USD(A&T), DOT&E, Services	Dec 1999
	Complete analysis of 1999 data and make final revision to CBMT	USD(A&T)	Sep 2000

Appendix A
Background Documents

Copies of the following background documents are included in this appendix.

A-1. Section 912, National Defense Authorization Act for Fiscal Year 1998

National Defense Authorization Act for Fiscal Year 1998

SEC. 912. DEFENSE ACQUISITION WORKFORCE.

(a) REDUCTION OF DEFENSE ACQUISITION WORKFORCE.--(1) The Secretary of Defense shall accomplish reductions in defense acquisition personnel positions during fiscal year 1998 so that the total number of such personnel as of October 1, 1998, is less than the total number of such personnel as of October 1, 1997, by at least the applicable number determined under paragraph (2).

(2)(A) The applicable number for purposes of paragraph (1) is 25,000. However, the Secretary of Defense may specify a lower number, which may not be less than 10,000, as the applicable number for purposes of paragraph (1) if the Secretary determines, and certifies to Congress not later than June 1, 1998, that an applicable number greater than the number specified by the Secretary would be inconsistent with the cost-effective management of the defense acquisition system to obtain best value equipment and would adversely affect military readiness.

(B) The Secretary shall include with such a certification a detailed explanation of each of the matters certified.

(C) The authority of the Secretary under subparagraph (A) may only be delegated to the Deputy Secretary of Defense.

(3) For purposes of this subsection, the term ``defense acquisition personnel'' means military and civilian personnel (other than civilian personnel who are employed at a maintenance depot) who are assigned to, or employed in, acquisition organizations of the Department of Defense (as specified in Department of Defense Instruction numbered 5000.58 dated January 14, 1992).

(b) REPORT ON SPECIFIC ACQUISITION POSITIONS PREVIOUSLY ELIMINATED.--Not later than 30 days after the date of the enactment of this Act, the Secretary of Defense shall submit to Congress a report on reductions in the defense acquisition workforce made since fiscal year 1989. The report shall show aggregate reductions by fiscal year and shall show for each fiscal year reductions identified by specific job title, classification, or position. The report shall also identify those reductions carried out pursuant to law (and how the Secretary implemented any statutory requirement for such reductions, including definition of the workforce subject to the reduction) and those reductions carried out as a result of base closures and realignments under the so-called BRAC process. The Secretary shall include in the report a definition of the term "defense acquisition workforce" that is to be applied uniformly throughout the Department of Defense.

(c) IMPLEMENTATION PLAN TO STREAMLINE AND IMPROVE ACQUISITION ORGANIZATIONS.--(1) Not later than April 1, 1998, the Secretary of Defense shall submit to Congress a report containing a plan to streamline the acquisition organizations, workforce, and infrastructure of the Department of Defense. The Secretary shall include with the report a detailed discussion of the recommendations of the Secretary based on the review under subsection (d) and the assessment of the Task Force on Defense Reform pursuant to subsection (e), together with a request for the enactment of any legislative changes necessary for implementation of the plan. The Secretary shall include in the report the results of the review under subsection (d) and the independent assessment of the Task Force on Defense Reform pursuant to subsection (e).

(2) In carrying out this subsection and subsection (d), the Secretary of Defense shall formally consult with the Chairman of the Joint Chiefs of Staff, the Director of Program Analysis and Evaluation, the Under Secretary of Defense (Comptroller), and the Under Secretary for Acquisition and Technology.

(d) REVIEW OF ACQUISITION ORGANIZATIONS AND FUNCTIONS.--The Secretary of Defense shall conduct a review of the organizations and functions of the Department of Defense acquisition activities and of the personnel required to carry out those functions. The review shall identify the following:

(1) Opportunities for cross-service, cross-functional arrangements within the military services and defense agencies.

(2) Specific areas of overlap, duplication, and redundancy among the various acquisition organizations.

(3) Opportunities to further streamline acquisition processes.

(4) Benefits of an enhanced Joint Requirements Oversight Council in the acquisition process.

(5) Alternative consolidation options for acquisition organizations.

(6) Alternative methods for performing industry oversight and quality assurance.

(7) Alternative options to shorten the procurement cycle.

(8) Alternative acquisition infrastructure reduction options within current authorities.

(9) Alternative organizational arrangements that capitalize on core acquisition competencies among the military services and defense agencies.

(10) Future acquisition personnel requirements of the Department.

(11) Adequacy of the Program, Plans, and Budgeting System in fulfilling current and future acquisition needs of the Department.

(12) Effect of technology and advanced management tools in the future acquisition system.

(13) Applicability of more flexible alternative approaches to the current civil service system for the acquisition workforce.

(14) Adequacy of Department of Defense Instruction numbered 5000.58 dated January 14, 1992.

(e) DUTIES OF TASK FORCE ON DEFENSE REFORM TO INCLUDE CONSIDERATION OF ACQUISITION ORGANIZATIONS.--(1) The Secretary of Defense shall require that the areas of study of the Task Force on Defense Reform (established by the Secretary of Defense on May 14, 1997, and headed by the Deputy Secretary of Defense) include an examination of the missions, functions, and responsibilities of the various acquisition organizations of the Department of Defense, including the acquisition workforce of the Department. In carrying out that examination of those organizations and that workforce, the Task Force shall identify areas of duplication in defense acquisition organization and recommend to the Secretary options to streamline, reduce, and eliminate redundancies.

(2) The examination of the missions, functions, and responsibilities of the various acquisition organizations of the Department of Defense under paragraph (1) shall include the following:

(A) An assessment of benefits of consolidation or selected elimination of Department of Defense acquisition organizations.

(B) An assessment of the opportunities to streamline the defense acquisition infrastructure that were realized as a result of the enactment of the Federal Acquisition Streamlining Act of 1994 (Public Law 103 355) and the Clinger-Cohen Act of 1996 (divisions D and E of Public Law 104 106) or as result of other acquisition reform initiatives implemented administratively during the period from 1993 through 1997.

(C) An assessment of such other options for streamlining or restructuring the defense acquisition infrastructure as the Task Force considers appropriate and as can be carried out under existing provisions of law.

(3) Not later than March 1, 1998, the Task Force shall submit to the Secretary a report on the results of its review of the acquisition organizations of the Department of Defense, including any recommendations of the Task Force for improvements to those organizations.

A-2. Section 907, National Defense Authorization Act for Fiscal Year 1999

National Defense Authorization Act for Fiscal Year 1999

SEC. 907. MANAGEMENT REFORM FOR RESEARCH, DEVELOPMENT, TEST, AND EVALUATION ACTIVITIES.

(a) ANALYSIS AND PLAN FOR REFORM OF MANAGEMENT OF RDTE ACTIVITIES.—(1) The Secretary of Defense, acting through the Under Secretary of Defense for Acquisition and Technology, shall analyze the structures and processes of the Department of Defense for management of its laboratories and test and evaluation centers. Taking into consideration the results of that analysis, the Secretary shall develop a plan for improving the management of those laboratories and centers. The plan shall include such reorganizations and reforms as the Secretary considers appropriate.

(2) The analysis under paragraph (1) shall include an analysis of each of the following with respect to Department of Defense laboratories and test and evaluation centers:

(A) Opportunities to improve efficiency and reduce duplication of efforts by those laboratories and centers by designating a lead agency or executive agent by area or function or other methods of streamlining management.

(B) Reform of the management processes of those laboratories and centers that would reduce costs and increase efficiency in the conduct of research, development, test, and evaluation activities.

(C) Opportunities for those laboratories and centers to enter into partnership arrangements with laboratories in industry, academia, and other Federal agencies that demonstrate leadership, initiative, and innovation in research, development, test, and evaluation activities.

(D) The extent to which there is disseminated within those laboratories and centers information regarding initiatives that have successfully improved efficiency through reform of management processes and other means.

(E) Any cost savings that can be derived directly from reorganization of management structures of those laboratories and centers.

(F) Options for reinvesting any such cost savings in those laboratories and centers.

(3) The Secretary shall submit the plan required under paragraph (1) to the congressional defense committees not later than 180 days after the date of the enactment of this Act.

(b) COST-BASED MANAGEMENT INFORMATION SYSTEM.—(1) The Secretary of Defense shall develop a plan, including a schedule, for establishing a cost-based management information system for Department of Defense laboratories and test and evaluation centers. The system shall provide for accurately identifying and comparing the costs of operating each laboratory and each center.

(2) In preparing the plan, the Secretary shall assess the feasibility and desirability of establishing a common methodology for assessing costs. The Secretary shall consider the use of a revolving fund as one potential methodology.

(3) The Secretary shall submit the plan required under paragraph (1) to the congressional defense committees not later than 90 days after the date of the enactment of this Act.

A-3. Defense Management Report Decision 922

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No. 922

DEFENSE MANAGEMENT REPORT DECISION

SUBJECT: Consolidation of R&D Laboratories and T&E Facilities

DOD COMPONENTS: Army, Navy, and Air Force

ISSUE: Additional efficiencies to be achieved through Service-directed RDT&E consolidations

	(TOA, Dollars in Millions)		
	FY1991	FY1992	FY 1993
Service Estimate	-	-	-
Alternative	-	-	-

SUMMARY OF EVALUATION: The purpose of this DMRD is to approve the proposals made by the Military Departments to increase the efficiency and reduce the cost of the Department's Research, Development, Test and Evaluation (RDT&E) operations. The alternative also provides more OSD oversight to improve the quality, productivity, and effectiveness of RDT&E. It identifies $1.1 billion in savings that can be achieved through these initiatives due to more interservice reliance in specific technology areas. Although the $1.1 billion savings have been reflected in the OSD/OMB Budget submission, USD(A) should provide, within 60 days from the date of this DMRD, a plan outlining management actions to achieve the savings.

ALTERNATIVE: Accept budgeted savings of $92.0 million in FY 1992 and total savings over $1.1 billion through FY 1997.

THE DEPUTY SECRETARY APPROVED THE ALTERNATIVE ESTIMATE EXCEPT FOR THE DEFENSE RDT&E COUNCIL. ALSO, HE DIRECTED THAT INTER-DEPARTMENTAL COMPETITION FOR S&T TASK EXECUTION SHALL BE ESTABLISHED BY DDR&E, NOT
DECISION DEFINED BY THE SERVICES. Date NOV 18 1990

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No. 922

DMRD Continuation Sheet

DETAIL OF EVALUATION:

This DMRD reflects the Military Departments proposals for improving the management, efficiency, and production of the RDT&E facilities. These arose out of the DMRD proposed in FY 1991 on the consolidation of RDT&E functions, and the subsequent study carried out under the direction of the Under Secretary of Defense for Acquisition (USD(A).

USD(A) has identified six objectives to improve the RDT&E program; however, only five are discussed below. The sixth objective tasked the Military Departments with developing and implementing comparable financial systems. Development and implementation of a financial system will be done in conjunction with the DoD Comptroller and the Corporate Information Management Group.

1. Implementation of a strengthened RDT&E management. A Defense RDT&E Council is to be established to aid the USD(A) in improving the quality, productivity and efficiency of the RDT&E program and infrastructure. The Council will monitor compliance with the strategy through review of Service POM inputs and in-process review of execution, coordinate Services' investment strategies (including proposed program investments greater than $2M in contractor DT&E facilities), provide a forum to raise issues, identify opportunities, and recommend resolution of any threshold variances. The Council will further support the USD(A) in the implementation of inter-departmental initiatives to enhance quality and efficiency through such efforts as consolidations, program leads, and competition.

2. Inter-Department reliance in technology. The Secretaries of the Military Departments have agreed that, for some areas of Science and Technology (S&T), savings and efficiencies will be generated in cases where one Military Department assumes the responsibility for providing technology to the other Military Department. This proposal will save $1.1 billion through FY 1992-1997.

3. Inter-Department consolidations/transfers. The Military Departments will identify opportunities for facility consolidations/transfers resulting from decisions made with regard to lead Departments for technologies. Savings from such consolidations may be used to offset program reductions which would be otherwise necessary.

4. Inter-Department Competition for S&T task execution. The Military Departments will define a competitive process and identify opportunities for inter-departmental competition for in-house S&T task executions where multiple Service capabilities exist.

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No. 922

DMRD Continuation Sheet

5. Implementation of RDT&E facility consolidation actions. Each of the Military Departments has proposed restructuring and streamlining of its RDT&E activities. Those actions not requiring congressional notification will proceed as quickly as possible.

This DMRD does not involve changes to the Services' budget estimates, since all but the Navy reflected the savings in their 1992-1993 budget submissions. The Navy's budget was adjusted, through PBD 275, which has been approved. The remaining actions are management actions. USD(A) should constitute and lead a working group comprised of representatives of the three Military Departments and DARPA to develop specific implementation plans and timetables for the five management actions listed above. These plans and timetables are to be completed within 60 days from the date of this DMRD, for review by the DoD Comptroller and approval by the Deputy Secretary.

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No. 922

DMRD Continuation Sheet

SUMMARY OF ADJUSTMENTS:

The following savings have been reflected in the OSD/OMB Budget submission:

($ in millions)

	FY 92	FY 93	FY 94	FY 95	FY 96	FY 97
Army						
RDT&E	-34.5	-52.6	-58.0	-73.0	-72.0	-72.0
Proc	-8.0	-13.0	-18.0	-23.0	-24.0	-24.0
MilCon	+5.5	+9.6				
Navy						
RDT&E	-48.0	-72.0	-96.0	-122.0	-122.0	-122.0
Air Force						
O&M	-	-3.0	-4.0	-4.0	-4.0	-4.0
RDT&E	-7.0	-13.0	-3.0	-14.0	-14.0	-14.0
Total	-92.0	-144.0	-179.0	-236.0	-236.0	-236.0

A-4. Summary of Actions in the RDT&E Infrastructure Resulting from Base Realignment and Closure Rounds in 1989, 1991, 1993, And 1995

Army

Action	Activity or Installation
Sites Closed	
	Aviation-Troop Support Command, St. Louis, MO
	Jefferson Proving Ground, Madison, IN
	Vint Hill Farms Station, Vint Hill Farms, VA
Other Activities Closed or to be Closed at Host Sites	
	Material Technology Lab, Watertown, MA
	Belvoir Research & Development Center, Fort Belvoir, VA
	Harry Diamond Lab, Woodbridge, VA
	Human Engineering Lab, Aberdeen Proving Ground, MD
	Atmospheric Sciences Lab, White Sands Missile Range, NM
	Vulnerability Assessment Lab, White Sands Missile Range, NM
	Electronics Technology and Devices Lab, Ft. Monmouth, NJ
	Biomedical Research Development Lab, Fort Detrick, MD
	Letterman Army Institute of Research, Presidio, CA
	Institute of Dental Research, Washington, D.C.
	TEXCOM Experimentation Center, Fort Hunter-Liggett, CA

Navy

Action	Activity or Installation
Sites Closed	
	Salton Sea Test Range, El Centro, CA
	Naval Civil Engineering Lab, Port Hueneme, CA
	Naval Sea Combat Systems Engineering Support, Norfolk, VA
	Naval Air Warfare Center, Trenton, NJ
	Naval Surface Warfare Center, White Oak, MD
	Naval Air Warfare Center, Warminister, PA
	Naval Underwater Sound Reference Lab, Orlando, FL
	Open Water Test Facility, Oreland PA
	Naval Undersea Warfare Center, New London , CT
	Naval Surface Warfare Center, Louisville, KY
	Naval Air Warfare Center, Indianapolis, IN

Action	Activity or Installation
	Naval Management Systems Software Office, Chesapeake, VA
	Naval Surface Warfare Center, Annapolis, MD
Other Activities Closed at Host Sites	
	Naval Electronic Security Systems Engineering Center, Washington, DC
	Naval Sea Automated Data Software Activity, Indian Head, MD
	Naval Surface Warfare Center, Yorktown, VA
	Naval Aviation Technical Services Facility, Philadelphia, PA
	Naval Aviation Engineering Support Unit, Philadelphia, PA
	Naval Medical Research Institute, Bethesda, MD
	Naval Biodynamics Lab, New Orleans, LA
	Naval Personnel Research and Development Center, San Diego, CA
	Nuclear Weapons Evaluation Facility, Albuquerque, NM
	Naval C4 In-Service Engineering Center, Norfolk, VA
	Naval C4 In-Service Engineering Center, San Diego, CA
	Integrated Combat Systems Test Facility, San Diego CA
	Naval Mine Warfare Engineering Activity, Yorktown, VA
	Naval Electronic Systems Engineering Center, Vallejo, CA
	TRIDENT Combat Control Systems Management Act., Newport, RI
	Naval Ocean Systems Center Det. Kaneohe, HI
	Naval Space Systems Activity, Los Angeles, CA
	Fleet Combat Direction Systems Support Activity, San Diego CA
	Naval Aviation Maintenance Office, Patuxent River, MD
	Naval Aviation Depot Operations Center, Patuxent River, MD
	Naval Sea Logistics Center, Mechanicsburg PA
	Naval Surface Warfare Center Det, Va. Beach, VA
	Submarine Maint. Engineering Plan. Procure. Act., Portsmouth, NH
	Planning, Estimating, Repair, Alterations, Headquarters, Norfolk, VA
	Planning, Estimating, Repair, Alterations, Atlantic, Norfolk, VA
	Planning, Estimating, Repair, Alterations, Pacific, Hunters Point, CA
	Planning, Estimating, Repair, Alterations, CV, Bremerton, WA

Air Force

Action	Activity or Installation
Sites Closed	
	Air Force Guidance and Metrology Center, Newark AFS, OH
	Sacramento Air Logistics Center, McClellan AFB, CA
	Real-Time Digitally Controlled Analyzer Processor (REDCAP), Buffalo, NY
Other Activities Closed at Host Sites	
	Sacramento Air Logistics Center, Peterson AFB, CO
	San Antonio Air Logistics Center, Kelly AFB, TX
	Ballistic Missile Organization, Norton AFB, CA
	4950th Test Wing, Wright-Patterson AFB, OH
	Electromagnetic Test Environment (EMTE), Eglin AFB, FL

A-5. Section 277, National Defense Authorization Act for Fiscal Year 1996

National Defense Authorization Act for Fiscal Year 1996

SEC. 277. FIVE YEAR PLAN FOR CONSOLIDATION OF DEFENSE LABORATORIES AND TEST AND EVALUATION CENTER.

(a) FIVE-YEAR PLAN.--The Secretary of Defense, acting through the Vice Chief of Staff of the Army, the Vice Chief of Naval Operations, and the Vice Chief of Staff of the Air Force (in their roles as test and evaluation executive agent board of directors) shall develop a five year plan to consolidate and restructure the laboratories and test and evaluation centers of the Department of Defense.

(b) OBJECTIVE.--The plan shall set forth the specific actions needed to consolidate the laboratories and test and evaluation centers into as few laboratories and centers as is practical and possible, in the judgment of the Secretary, by 1 October 2005.

(c) PREVIOUSLY DEVELOPED DATA REQUIRED TO BE USED.--In developing the plan, the Secretary shall use the following:

1. Data and results obtained by the Test and Evaluation Joint Cross-Service Group and the Laboratory Joint Cross-Service Group in developing recommendations for the 1995 report of the Defense Base Closure and Realignment Commission.

2. The report dated March 1994 on the consolidation and streamlining of the test and evaluation infrastructure, commissioned by the test and evaluation board of directors, along with all supporting data and reports.

(d) MATTERS TO BE CONSIDERED

In developing the plan, the Secretary shall consider, at a minimum, the following:

1. Consolidation of common support functions, including the following:

Aircraft (fixed wing and rotary) support

Weapons support

Space systems support

Support of command, control, communications, computers, and intelligence.

2. The extent to which any military construction, acquisition of equipment, or modernization of equipment is planned at the laboratories and centers.

3. The encroachment on the laboratories and centers by residential and industrial expansion.

4. The total cost to the Federal Government of continuing to operate the laboratories and centers.

5. The cost savings and program effectiveness of locating laboratories and centers at the same sites.

6. Any loss of expertise resulting from the consolidations.

7. Whether any legislation is necessary to provide the Secretary with any additional authority necessary to accomplish the downsizing and consolidation of the laboratories and centers.

(e) REPORT.--Not later than May 1, 1996, the Secretary of Defense shall submit to the congressional defense committees a report on the plan. The report shall include an identification of any additional legislation that the Secretary considers necessary in order for the Secretary to accomplish the downsizing and consolidation of the laboratories and centers.

(f) LIMITATION.--Of the amounts appropriated or otherwise made available pursuant to an authorization of appropriations in section 201 for the central test and evaluation investment development program, not more than 75 percent may be obligated before the report required by subsection (e) is submitted to Congress.

A-6. Definition of Laboratories and T&E Centers developed by Vision 21

Laboratory Definition

The definition of a laboratory is any DoD activity that performs one or more of the following functions: science and technology, engineering development, systems engineering, and engineering support of deployed material and its modernization. Each Service and DoD agency organizes differently for such functions, but the term embraces laboratories; research institutes; and research, development, engineering, and technical activities.

Test and Evaluation Center Definition

Any facility or capability that will be used for data collection; and will be DoD-owned or DoD-controlled property (air/land/sea or space) or any collection of equipment, platforms, automated data processing equipment, or instrumentation that conducts a T&E operation and provides a deliverable T&E product.

A-7. Lists of Laboratories and T&E Centers Considered in the Section 912(c) Studies

DoD Laboratories

Affiliation	Laboratory
Office of the Secretary of Defense	Armed Forces Radiological Research Institute, Bethesda, MD
Army	Army Research Laboratory, Adelphi, MD
	Army Research Laboratory, Aberdeen Proving Grounds, MD
	Army Research Laboratory, White Sands Missile Range, NM
	Army Research Laboratory, NASA, Langley Research Center, VA
	Army Research Laboratory, NASA, Glenn Research Center, OH
	Natick Research, Development and Engineering Center, Natick, MA
	Aviation Research, Development and Engineering Center, St. Louis, MO
	Aviation Troop Command, Aeroflight Dynamics Directorate, Moffett Field, CA
	Aviation Troop Command, Aviation Applied Technology Directorate, Fort Eustis, VA
	Edgewood Research, Development and Engineering Center, Aberdeen Proving Ground, MD
	Communications Electronics Command Research, Development and Engineering Center, Ft. Monmouth, NJ
	Communication Electronics Command Research, Development and Engineering Center-Night Vision Electro-Optics Directorate, Ft. Belvoir, VA
	Missile Research, Development and Engineering Center, Redstone Arsenal, AL
	Armaments Research, Development and Engineering Center, Picatinny Arsenal, NJ
	Armaments Research, Development and Engineering Center, Benet Labs, Watervliet Arsenal, NY
	Tank-Automotive Command Research, Development and Engineering Center, Warren, MI
	USA Research Institute of Infectious Diseases, Ft. Detrick, MD
	Walter Reed Army Institute of Research, Washington, DC
	Institute of Surgical Research, Ft. Sam Houston, TX

Affiliation	Laboratory
	Aeromedical Research Lab, Ft. Rucker, AL
	Medical Research Institute of Chemical Defense, Aberdeen Proving Ground, MD
	Research Institute of Environmental Medicine, Natick, MA
	Construction Engineering Research Laboratory, Champaign, IL
	Cold Regions Research and Engineering Lab, Hanover, NH
	Topographic Engineering Center, Alexandria, VA
	Waterways Experiment Station, Vicksburg, MS
	Research Institute for Behavioral & Social Sciences, Alexandria, VA
	Simulation, Training and Instrumentation Command, Orlando, FL
	High Energy Laser Systems Test Facility, White Sands Missile Range, NM
Navy	
	Naval Air Warfare Center, Weapons Division, China Lake, CA
	Naval Air Warfare Center, Weapons Division, Point Mugu, CA
	Naval Air Warfare Center, Aircraft Division, Patuxent River, MD
	Naval Air Warfare Center, Aircraft Division, Lakehurst, NJ
	Naval Research Lab, Washington, DC
	Naval Research Lab Detachment, Bay St. Louis, MS
	Naval Surface Warfare Center, Carderock Division, Bethesda, MD
	Naval Surface Warfare Center, Crane Division, Crane, IN
	Naval Surface Warfare Center, Dahlgren Division, VA
	Naval Surface Warfare Center, Dahlgren Detachment, Panama City, FL
	Naval Surface Warfare Center, Indian Head Division, MD
	Naval Surface Warfare Center, Port Hueneme Division, Port Hueneme, CA
	Naval Surface Warfare Center, Bayview, ID
	Naval Command, Control, and Ocean Surveillance Center, San Diego, CA
	Naval Command, Control, and Ocean Surveillance Center, In-Service Engineering Division, Charleston, SC
	Naval Command, Control, and Ocean Surveillance Center, In-Service Engineering Division, Pearl Harbor, HI
	Naval Aerospace Medical Research Center, Pensacola, FL

Affiliation	Laboratory
	Naval Dental Research Lab, Great Lakes, IL
	Naval Health Research Center, San Diego, CA
	Naval Undersea Warfare Center, Keyport Division, Keyport, WA
	Naval Surface Warfare Center, Carderock Division, Philadelphia Det., Philadelphia, PA
	Naval Undersea Warfare Center, Newport, RI
	Naval Research Lab, Monterey Det., Monterey, CA
	Naval Air Systems Command (engineering functions)
	Naval Sea Systems Command (engineering functions)
	Naval Air Warfare Center Training Systems Division, Orlando, FL
	Naval Clothing and Textile Research Facility, Natick, MA
	Naval Facilities Engineering Service Center, Port Hueneme, CA
	Naval Submarine Medical Research Laboratory, Groton, CT
	AEGIS, Wallops Island, VA
	AEGIS, Morristown, NJ
	Naval Warfare Assessment Division, Corona, CA
	Explosive Ordnance Disposal Technical Center, Indian Head, MD
	Naval Ordnance Center, Indian Head, MD
	Naval Sea Logistics Center, Mechanicsburg, PA
	Fleet Technical Support Center, Mayport, FL
	Fleet Technical Support Center, San Diego, CA
	Fleet Technical Support Center, Pearl Harbor, HI
Air Force	
	Air Force Research Laboratory, Wright-Patterson AFB, OH Operating Locations:
	Wright-Patterson AFB, OH
	Brooks AFB, TX
	Mesa, AZ
	Eglin AFB, FL
	Tyndall AFB, FL
	Kirtland AFB, NM
	Hanscom AFB, MA
	Edwards AFB, CA

Affiliation	Laboratory
	Griffiss AFB, Rome, NY
	Aeronautical Systems Center, Wright-Patterson AFB, OH (engineering functions)
	Electronic Systems Center, Hanscom AFB, MA (engineering functions)
	Space & Missile Center, Los Angeles AFB, CA (engineering functions)
	Air Armament Center, Eglin AFB, FL (engineering functions)
	Oklahoma City Air Logistics Center, Tinker AFB, OK (engineering functions, excluding supply, depot maintenance, and host base support)
	Ogden Air Logistics Center, Hill AFB, UT (engineering functions, excluding supply, depot maintenance, and host base support)
	Warner-Robins Air Logistics Center, Robins AFB, GA (engineering functions, excluding supply, depot maintenance, and host base support)

DoD Test and Evaluation Centers[1]

Affiliation	Test and Evaluation Center
Army	
	Aberdeen Test Center, Aberdeen Proving Ground, MD
	Redstone Technical Test Center, Redstone Arsenal, AL
	White Sands Missile Range, NM
	Yuma Proving Ground, AZ
	Dugway Proving Ground, UT
	Aviation Technical Test Center, Ft. Rucker, AL
	Kwajalein Atoll, Marshall Islands
	Test and Experimentation Command, Ft. Hood, TX
	Operational Threat Support Activity
	Yuma Proving Ground, Cold Regions Test Center, Fort Greely, AK
	Yuma Proving Ground, Tropic Test Activity, Panama
	White Sands Missile Range, Electronic Proving Ground, Fort Huachuca, AZ
Navy	

[1] Includes Navy RDT&E Centers with major T&E capabilities.

Affiliation	Test and Evaluation Center
	Naval Air Warfare Center, Weapons Division, China Lake, CA
	Naval Air Warfare Center, Weapons Division, Point Mugu, CA
	Naval Air Warfare Center, Aircraft Division, Patuxent River, MD
	Naval Air Warfare Center, Aircraft Division, Lakehurst, NJ
	Naval Research Lab, Washington, DC
	Naval Surface Warfare Center, Carderock Division, Bethesda, MD
	Naval Surface Warfare Center, Crane Division, Crane, IN
	Naval Surface Warfare Center, Dahlgren Division, VA
	Naval Surface Warfare Center, Dahlgren Detachment, Panama City, FL
	Naval Surface Warfare Center, Indian Head Division, MD
	Naval Surface Warfare Center, Port Hueneme Division, Port Hueneme, CA
	Naval Command, Control, and Ocean Surveillance Center, San Diego, CA
	Naval Command, Control, and Ocean Surveillance Center, In-Service Engineering Division, Charleston, SC
	Naval Undersea Warfare Center, Keyport Division, Keyport, WA
	Naval Surface Warfare Center, Carderock Division, Philadelphia Det., Philadelphia, PA
	Naval Undersea Warfare Center, Newport, RI
	Pacific Missile Range Facility, Kauai, HI
	Atlantic Fleet Weapons Training Facility, Naval Station Roosevelt Roads, PR
Air Force	
	Air Force Flight Test Center, Edwards AFB, CA
	Air Force Development Test Center, Eglin AFB, FL
	Air Force Flight Test Center (AFEWES), Ft. Worth, TX
	Arnold Engineering Development Center, Arnold AFS, TN
	46th Test Group, Holloman AFB, NM
	Nellis Range Complex, Nellis AFB, NV
	Air Force Reserve Test Center, Tucson, AZ
Defense Threat Reduction Agency	
	DECADE, Arnold AFS, TN
	Tonapah Test Range, Tonapah, NV
	Thermal Radiation Simulator, Kirtland AFB, NM
	Advanced Research Electromagnetic Simulator, Kirtland AFB, NM

Affiliation	Test and Evaluation Center
	PI X-Ray Simulator (DOUBLE EAGLE), San Leandro, CA
	X-Ray Simulator (PITHON), San Leandro, CA
Defense Information Support Agency	
	Joint Interoperability Test Command, Ft. Huachuca, AZ
Ballistic Missile Defense Organization	
	Joint National Test Facility, Schriever AFB, CO
Director, Test Systems Engineering and Evaluation	
	Precision Guided Weapons Countermeasures Test and Evaluation Directorate (OTD), White Sands Missile Range, NM

A-8. Definition of Infrastructure Developed by Vision 21

Infrastructure is defined as the airspace, land, seaspace, installations, buildings, facilities, roads, utilities, equipment, recurring activities, and support services (including government and contractor manpower) on which the continuance and sustainment of a DoD laboratory (lab, RDEC, warfare center, engineering support organization) or T&E center depends.

A-9. Secretary of Defense Memorandum, Implementation of Actions Included in the Section 912(c) Report to Congress, July 13, 1998

THE SECRETARY OF DEFENSE
WASHINGTON, DC 20301-1000

13 JUL 1998

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
ASSISTANT SECRETARIES OF DEFENSE
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
DIRECTOR, OPERATIONAL TEST AND EVALUATION
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTORS OF THE DEFENSE AGENCIES

Subject: Implementation of Actions Included in the Section 912(c) Report to Congress

On April 1, 1998, I submitted to Congress the implementation plan, required by section 912(c) of the National Defense Authorization Act for Fiscal Year 1998, to streamline acquisition organizations, workforce, and infrastructure. In that plan, I identified a number of studies that I believe are needed to determine the specific actions necessary to enhance the ability of the acquisition workforce to acquire the best available technology affordably and to keep our armed forces in a position of dominance.

I assign responsibility to the Under Secretary of Defense (Acquisition & Technology) to implement the actions identified in the Report to Congress.

A-10. USD(A&T) Memorandum, Development of an Implementation Plan to Streamline the Science and Technology, Engineering, and Test and Evaluation Infrastructure, August 17, 1998

THE UNDER SECRETARY OF DEFENSE
3010 DEFENSE PENTAGON
WASHINGTON D.C 20301-3010

ACQUISITION AND
TECHNOLOGY

17 AUG 1998

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
DIRECTOR DEFENSE RESEARCH AND ENGINEERING
ASSISTANT SECRETARIES OF DEFENSE
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
DEPARTMENT OF DEFENSE INSPECTOR GENERAL
DIRECTOR OF OPERATIONAL TEST AND EVALUATION
DIRECTOR OF ADMINISTRATION AND MANAGEMENT
DIRECTORS OF THE DEFENSE AGENCIES

Subject: Development of an Implementation Plan to Streamline the Science and Technology, Engineering, and Test and Evaluation Infrastructure

Under Section 912(c) of the National Defense Authorization Act for Fiscal Year 1998, the Secretary of Defense conducted a review of the organizations and functions of the Department of Defense acquisition activities and of the personnel required to carry out those functions. In the Secretary's letter to Congress transmitting the report required by section 912c, he committed to a study to lead to streamlining the science and technology, engineering, and test and evaluation (T&E) infrastructure. In a memorandum dated July 13,1998, the Secretary assigned to me the responsibility to implement the report.

Accordingly, I direct establishment of a Senior Steering Group to advise me on intra-Service, cross-Service, and by warfighting technology area, the requirements and capabilities of all components of DoD to conduct science and engineering (both Product Center engineering and systems engineering) and on intra-Service and cross-Service capabilities of test and evaluation facilities and ranges.The output of my study will be an implementation plan, with timelines, for restructuring and revitalizing the laboratory, engineering and T&E infrastructure. The charter for the Senior Steering Group and the study are attached.

As specified in the Charter, the Senior Steering Group shall provide a report on its conclusions and recommendations to me by April 1, 1999.

J. S. Gansler

CHARTER FOR THE SCIENCE AND TECHNOLOGY, ENGINEERING, AND TEST AND EVALUATION SENIOR STEERING GROUP AND INFRASTRUCTURE STREAMLINING STUDY

INTRODUCTION AND BACKGROUND

Joint Vision 2010, the Department's conceptual template for achieving the required levels of effectiveness in joint warfighting, depends heavily on DoD's ability to leverage new and emerging technological opportunities.

AUTHORITY AND DIRECTION

The Under Secretary of Defense (A&T) is establishing a Senior Steering Group (SSG) to advise him on the development of an implementation plan for streamlining the Science and Technology, Engineering, and Test and Evaluation infrastructure. The SSG will be chaired by the USD (A&T) and will include the Service Vice Chiefs, the Service Acquisition Executives, the Principal Deputy USD (A&T), the Director, Defense Research and Engineering, the Director, Operational Test and Evaluation, the Director, Force Structure, Resources and Assessment, the Joint Staff, the Director, Ballistic Missile Defense Organization and the Director, Test, Systems Engineering and Evaluation. The Director, Test, Systems Engineering and Evaluation (D,TSE&E) and the Deputy Director, Defense Research and Engineering (Laboratory Management & Technology Transition) (DDDR&E(LM&TT)) shall direct and oversee working groups to conduct studies of technology requirements and capabilities of our in-house test centers and laboratories/engineering centers, respectively. The outputs of the working groups will be combined to recommend a comprehensive RDT&E structure for review by the SSG. The recommendation will include an implementation plan, with timelines, that considers laboratories, engineering centers and T&E centers together. The working groups will include members nominated by the SSG members and shall include members with laboratory and test and evaluation experience, from the practitioner, facility management, and resource management perspectives. The study will use the definitions of "laboratories", "test and evaluation centers" and "infrastructure" developed as part of the "Vision 21" study (Attachment 1).

STUDY OBJECTIVES

The study will evaluate, intra-Service, cross-Service and by warfighting technology area, according to the taxonomy developed under Vision 21, the requirements and capabilities of all components in DoD to conduct science and technology, engineering (both Product Center engineering and systems engineering), and test and evaluation. The study will establish the desired RDT&E infrastructure necessary to accomplish the Department's technology program for the 21st Century.

6. Opportunities for DoD laboratories and test and evaluation centers to carry out cooperative activities with laboratories in industry, academia, and other Federal agencies, using competitive procedures, where market forces can be utilized for maximum innovation as well as cost, schedule and performance benefits.

7. Alternate organizational structures and reporting chains such as bi-service or tri-service commands, joint rotating commands, GOCO operations, or executive service responsibilities. Ensure that such operations are supported in Program Objective Memoranda by all stakeholders, e. g., the Service components of a joint command.

8. Total cost to the taxpayer (all funding and personnel, direct and indirect costs) of all functional areas for each service.

9. Options for and impediments to reinvesting cost savings in the DoD laboratories and test and evaluation centers.

SCHEDULE

The Senior Steering Group shall review the implementation plan and advise the USD(A&T) on the recommendation by April 1, 1999. The D,TSE&E and DDDR&E(LM&TT) will provide interim reports on their progress to the SSG each 60 days after the effort begins. They will report their plans for proceeding to the SSG not later than September 1, 1998.

RELATED STUDIES

As part of the Department's response to Section 912(c) and as part of previous management initiatives, there are additional studies which are complementary to and should be coordinated with the RDT&E Infrastructure Structure study chartered here. These include:

Recruit, Develop and Retain Technology Leaders: The quality of the personnel who staff the Department's RDT&E organizations is key to the ability of those organizations to perform their missions with the highest possible competence. This study is intended to look at policies and mechanisms to ensure DoD's ability to attract, reward and maintain a high quality workforce. This study will be conducted by a DoD Steering Group.

Integrated Test and Evaluation Process: The purpose of this study is to examine developmental and operational T&E processes and recommend improvements and

reengineering that will reduce test cycle time and cost. This study is being conducted by a Defense Science BoardTask Force on Test and Evaluation.

Technology Capabilities of non-DoD Sectors of the Government, Industry and Academia: This study will examine by warfighting technology area the capabilities of other technology providers and provide real-time feedback to the in-house RDT&E study to allow for informed decisions on, for example, competitive sourcing of technology. The study will be conducted by a Defense Science Board Task Force.

National Test Facility Advisory Council studies: These studies are examining various categories of test facilities operated by DoD, NASA and industry to optimize the efficiency of key national assets and facilitate restructuring decisions.

A-11. USD(A&T) – USD(C) Memorandum, Migration of Laboratories to a Working Capital Fund Financial Management Structure, April 30, 1999

OFFICE OF THE SECRETARY OF DEFENSE

1000 DEFENSE PENTAGON
WASHINGTON, DC 20301-1000

30 APR 1999

MEMORANDUM FOR SECRETARY OF THE ARMY
SECRETARY OF THE NAVY
ACTING SECRETARY OF THE AIR FORCE

SUBJECT: Migration of Defense Laboratories to a Working Capital Fund Financial Management Structure

In order to implement the findings of an Integrated Product Team (IPT) chartered on February 24, 1997, to ensure a common approach for lab comparability, the Military Departments and DDR&E have sought to develop a common financial management approach for Army, Navy, and Air Force laboratories. This is required to provide full cost visibility and comparability of cost elements and pricing for all customers of the laboratories. The DDR&E has endorsed a migration of the laboratories to a Working Capital Fund (WCF) environment using a flexible rate structure to meet this need. The Navy currently operates under the auspices of the WCF while the Army employs a hybrid arrangement wherein selected laboratories operate under a revolving fund. The Air Force funds their laboratories through direct appropriations.

Achieving the IPT goal of assessing the full operating costs of a Defense laboratory is essential if the Department is to ascertain the need for the current laboratory infrastructure. Since the WCF environment provides the necessary financial tools, it would aid in accomplishing this goal. The Air Force and Army prefer to demonstrate an alternative approach for their laboratories, which would provide full cost visibility but not require full cost recovery. The Air Force has indicated they achieved laboratory full cost visibility during FY 1998 by use of the expanded Air Force Job Order Cost Accounting System (JOCAS).

To implement the findings of the IPT during FY 1999 and to demonstrate the data collection capability of alternative full cost systems, the Army and Air Force will implement their approach on a trial basis. The IPT identified common cost elements that should be collected as direct, indirect, and overhead costs. The costs of military labor are to be included in data collection efforts.

The Army and Air Force will use FY 1999 to assess the impact of full cost visibility on their programs. The Navy labs will adopt a WCF with a flexible rate structure. The Navy will work with the USD(C) to install the required modifications.

Upon completion of the effort, a report will be prepared by each Service and submitted by September 30, 1999, to USD(A&T) and USD(C). The report will address all aspects of the effort, including data collection methods, significant results, impacts on customers, major decisions made, business process improvements, and how the full cost visibility without full cost recover achieved IPT goals.

An assessment of the Army and Air Force data will be done at the end of FY 1999. If full cost visibility without full cost recovery does not meet the IPT goals, the laboratories will be placed in the WCF beginning in FY 2001 on a reimbursable costs basis with full revenue rates developed for FY 2002. In this event, during FY 2000, DFAS, in conjunction with the Army and Air Force, will prepare for full inclusion of the Army and Air Force laboratories into the WCF.

Jacques S. Gansler
Under Secretary of Defense
(Acquisition and Technology)

William J. Lynn
Under Secretary of Defense
(Comptroller)

ARMY IMPLEMENTATION PLAN

912(C) LABORATORY AND TEST CENTER INFRASTRUCTURE REDUCTION

Executive Summary

This section of the Department of Defense report describes the Army intra-service implementation plan. The Army's plan follows the direction of the Under Secretary of Defense (Acquisition and Technology) in his 17 August 1998 memorandum, and provides the data by warfighting technology areas as defined by the taxonomy contained in the Cost Based Management Tool (CBMT). The Army report not only looks forward to FY01 and FY05 as required by guidance, but also puts the required reductions in the context of the overall downsizing since the peak years of FY89-92. As a consequence of the Base Realignment and Closure (BRAC) process, Army has "front-loaded" the infrastructure downsizing in some installations during the BRACs, while others have taking substantial cuts since FY96, the baseline year for this report. An important point to note is that the reductions during those years have included infrastructure reductions along with the personnel reductions of engineers and scientists.

The report's objective is to identify Army's FY96 lab and test center infrastructure costs as a function of the eight warfighting technology areas, using the data made available to the Army from the CBMT. Finally, we have provided estimates of the infrastructure reductions based on our view of the future from today's vantagepoint. These plans could change dramatically in several ways. The first would be a minor or major change of mission, unforeseen today, as a result of Congressional or Presidential directives, or to a peacetime or wartime emergency. Secondly, should the Congress provide BRAC authority, choices and options of reductions other than those currently envisioned could be substantially changed.

Reductions in Army laboratory and test center personnel since the peak years of 89-90 are shown in Figure 1. . While all of these spaces can not be considered as wholly infrastructure costs, they all contribute to the reductions.

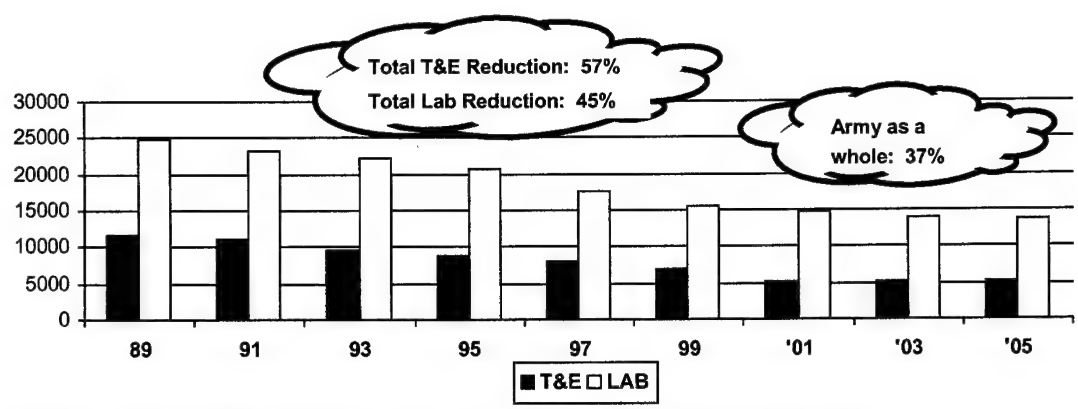


Figure 1 Army laboratory and test center personnel glide path

A roll-up of Army technical and infrastructure costs are shown in Table 1 below

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	136388	96855	71.0%	39533	29.0%	4.0%
3.2 – Civilian Labor	1427866	1082046	75.8%	345820	24.2%	35.3%
3.3 – Travel	80504	67762	84.2%	12742	15.8%	1.3%
3.4 – Contractor Services*	2103993	1871777	89.0%	232216	11.0%	23.7%
3.5 – Other Gov't Services	539258	455455	84.5%	83803	15.5%	8.6%
3.6 – Minor Equip	272594	194140	71.2%	78454	28.8%	8.0%
3.7 – Common BOS	136509	0		136509		13.9%
3.8 – Increment BOS	29135	0		29135		3.0%
3.10 – Land Use	15923	0		15923		1.6%
3.12 – Leased Buildings	8210	4147	50.5%	4063	49.5%	0.4%
3.14 – Leased Cap Equip	1358	535	39.4%	823	60.6%	0.1%
Total	4751738	**3772717**	79.4%	**979021**	20.6%	100.0%
Support Taxonomy						
Command Mgt./Admin				173355	17.7%	
Facilities Support				282060	28.8%	
Financial Mgt.				48295	4.9%	
Human Resources				29763	3.0%	
Contracts Admin.				37843	3.9%	
Supply Support				77765	7.9%	
C2 Data Systems				60359	6.2%	
Military Support Act				11372	1.2%	
Other Support				76642	7.8%	
Common BOS				136509		
Incremental BOS				29135	16.9%	
Land Use				15923	1.6%	
Total				**979021**	100.0%	
Warfighting Technology Area						
Air Systems		152518	4.0%	39578		
Electronic Combat		44786	1.2%	11622		
Armaments/Munitions		1450176	38.4%	376321		
Space Systems		17133	0.5%	4446		
Land Systems		442048	11.7%	114712		
Sea Systems		6046	0.2%	1569		
C4I		568234	15.1%	147457		
Corporate Technology		764598	20.3%	198413		
Other Technical		327178	8.7%	84903		
Total		**3772717**	100.0%	**979021**		

Table 1 Army Total FY96 Technical and Infrastructure Costs ($K)

Utilizing the support column from Table 1 above, the Army has established the infrastructure cost reduction goals depicted in Table 2 below. The Army's initial assessment is that we will accrue approximately a 10.1% reduction by FY01 (as opposed to the 10% goal) and approximately a 23.3% reduction by FY05 (as opposed to a 25% goal). Details of the infrastructure cost reduction initiatives are found in the accompanying Army report.

Warfighting Technology Area	FY96 Infrastructure Support Costs	FY01 Reduction Target		FY05 Reduction Target	
		$M	Percent	$M	Percent
Air Systems	39.6	4.2	10.4%	9.2	23.2%
Electronic Combat	11.6	1.0	8.6%	2.0	17.2%
Armament/Munitions	376.3	37.5	10.0%	91.6	24.3%
Space Systems	4.4	0.1	2.6%	0.3	6.3%
Land Systems	114.7	11.0	9.6%	27.5	24.0%
Sea Systems	1.6	0.0	0.6%	0	0.0%
C4I	147.5	15.0	10.3%	36.6	24.8%
Corporate Tech.	198.4	22.6	11.4%	42.3	21.3%
Other Technical	84.9	7.1	8.4%	19.1	22.5%
Total	979.0	98.5	10.1%	228.5	23.3%

Table 2 Planned Infrastructure Reductions through FY05 ($M)

The Army's plan with respect to A-76 and non-A-76 reductions is shown in the following table.

	FY01	FY05
Total Infrastructure Reductions	$98.5M	$228.5M
A76 Personnel Cost Reductions	$14.0M	$15.8M
Non-A-76 Personnel Cost Reductions	$64.6M	$174.9M
Other Cost Reductions	$19.9M	$37.8M
Amount NOT in POM	$7.8M	$18.6M
Personnel Space Reductions		
A76 Personnel Headcount	456	463
Non-A-76 Personnel Headcount	2945	3864

Table 3 A-76 and Non-A-76 Personnel Reductions through FY05

While we followed the guidance to portray our reductions in terms of warfighting technology areas, we want to reemphasize that the saving initiatives are not geared to specific technologies but to infrastructure that covers all technologies within a given site.

The reductions that will be generated will be taken in the most efficient and effective areas within our installations.

A significant portion of infrastructure costs included in the CBMT is not under the complete control of RDT&E managers. Subordinate activities, as tenants on installations owned by others, have no control over the cost of common level base operating support. Similarly, Army lab and test center managers have only partial control over incremental level base operating support costs and the cost of military labor.

These savings, a portion of which have already been achieved, result from a combination of reductions in facilities and capital equipment, increased efficiency of support services, enhanced management processes, and reductions in general and administrative personnel. No further reductions in infrastructure expenses could be identified between FY 01 and FY 05 that would not result in a loss of core mission capability.

1. Introduction

1.A General

This section of the Department of Defense report describes the Army intra-service implementation plan. The Army's plan follows the direction of the Under Secretary of Defense (Acquisition and Technology) in his 17 August 1998 memorandum, and provides the data by warfighting technology areas as defined by the taxonomy contained in the Cost Based Management Tool (CBMT). It further sorts the data by major Army command (MACOM). The reason for the latter sorting is the wide divergence of mission responsibilities of the Army laboratories and the T&E centers. For example, not only does the U.S. Army Corps of Engineers have responsibilities for military missions, but it is also responsible for Federal civil works. The U.S. Army Medical Research and Materiel Command provides the services with the majority of its medical R&D. They have, in recent years, received major funding enhancements by the Congress in new areas such as breast cancer research.

The Army report not only looks forward to FY01 and FY05 as required by guidance, but also puts the required reductions in the context of the overall downsizing since the peak years of FY89-92. Each of the MACOMs participated in the Base Realignment and Closure (BRAC) process to different degrees. As a consequence, some MACOMs have "front-loaded" the infrastructure downsizing during the BRACs, while others are taking substantial cuts since FY96, the baseline year for this report. Each MACOM will report on its downsizing since the peak year through FY96 and to the goal years of FY01 and FY05. An important point to note is that the reductions during those years have included infrastructure reductions along with the personnel reductions of engineers and scientists.

1.B Approach

The report's objective is to identify Army's FY96 lab and test center infrastructure costs as a function of the eight warfighting technology areas, using the data made available to the Army from the CBMT. The Army methodology consisted of first identifying the technical costs associated with each of the warfighting technology areas, and determining the percentage of the total technical amount associated with each area. Concurrently, the laboratory and test center infrastructure costs were identified according to both the financial categories and the infrastructure support taxonomies and a total infrastructure cost was derived. Finally, the above percentage was applied to the total infrastructure costs and an estimate for the infrastructure costs per warfighting technology areas was determined.

The next six sections outline the plans of each of the Army MACOMs and FOAs participating in this exercise:

- U.S. Army Materiel Command
- U.S. Army Medical Research and Materiel Command
- U.S. Army Corps of Engineers
- U.S. Army Space & Missile Defense Command
- U.S. Army Operational Test and Evaluation Command
- U.S. Army Research Institute

Each MACOM and FOA has provided estimates of the infrastructure reductions based on its view of the future from today's vantagepoint. These plans could change dramatically in several ways. The first would be a minor or major change of mission, unforeseen today, as a result of Congressional or Presidential directives, or to a peacetime or wartime emergency. Secondly, should the Congress provide BRAC authority, choices and options of reductions other than those currently envisioned could be substantially changed.

1.C Cost-Based Management Tool

The CBMT was used as the basis of this infrastructure cost reduction analysis. Costs were broken out into the financial categories listed in Table 1.1. With the exception of items 3.7, 3.8 and 3.10, data in each of the categories was broken out into the eight warfighting technology areas (Air Systems, Electronic Combat, Armaments/Munitions, Space Systems, Land Systems, Sea Systems, C4I, Corporate Technologies, Other Technical). CBMT data were also collected in the infrastructure support taxonomies listed in Table 1.2.

3.1	–	Military Labor
3.2	–	Civilian Labor
3.3	–	Travel
3.4	–	Contractor Services
3.5	–	Other Government Services
3.6	–	Minor Equipment
3.7	–	Common Level Base Operating Support (BOS)
3.8	–	Increment Level Base Operating Support (BOS)
3.10	–	Land Use
3.12	–	Leased Buildings
3.14	–	Leased Capital Equipment

Table 1.1 CBMT Financial Categories

Command Mgt./Admin
Facilities Support
Financial Management.
Human Resources
Contracts Administration
Supply Support
C2 Data Systems
Military Support Act
Other Support

Table 1.2 CBMT Infrastructure Support Taxonomies

The CBMT data for metrics 3.11, Government Owned Buildings, and metric 3.13, Government Owned Capital Equipment, were not factors in any infrastructure computations for a cost reduction baseline.

2. U.S. Army Materiel Command (AMC)

2. A – Previous Infrastructure Reductions - Peak Year to FY99

Since the peak years of 1989 and 1990, AMC has undergone a series of cost reduction initiatives and redesign. Figure 2.1 below shows the significant consolidations and closures that have taken place in association with our labs and test centers since 1989/1990.

Consolidations			
(1990)	AVSCOM, LABCOM, MICOM Test Assets	→	TECOM
(1991)	AVSCOM + TROSCOM	=	ATCOM
(1992)	7 Labs + 8 Elements	=	ARL
(1992)	PM Trade + 4 PMs	=	STRICOM
(1993)	TACOM + ACALA + ARDEC	=	TACOM
(1994)	Natick + 2 Activities	=	SSCOM
(1995)	CRDEC + 8 Activities	=	CBDCOM
(1995)	ATCOM + MICOM	=	AMCOM
(1999)	SSCOM + CBDCOM	=	SBCCOM

Closures		Installation	State
	(1988)	Jefferson Proving Ground	IN
	(1988)	Watertown Material Tech Lab	MA
	(1993)	Ft. Belvoir RDEC	VA
	(1993)	Vint Hills Farms Station	VA
	(1995)	Aviation & Troop Command	MO

Figure 2.1 AMC restructuring since the 1989/90 peak personnel years.

The latest reduction initiative having the largest impact was the Quadrennial Defense Review (QDR) initiative that dramatically reduced the overall manpower and associated costs within AMC. Current plans include a call for a 1,567 reduction in RDTE personnel as a result of restructuring, a reduction of 257 spaces as a result of a redesign of the software organization at one command, and a reduction of 52 spaces in the information management arena. All of these initiatives will have a significant impact on the infrastructure associated with our labs and test centers. As part of QDR, we also combined two commands, the Soldier System Command and the Chemical-Biological Defense Command, into the Soldier Biological and Chemical Command. This included two Research, Development and Engineering Centers (RDECs) and resulted in a reduction to the infrastructure needed to operate the two. The QDR will also result in the combination of the two RDECs now under AMCOM. A portion of those cost reductions were directly associated with the infrastructure within the laboratories and test centers with most of the reductions coming in the years FY02 and FY03. The reduction initiatives took on varied names and specificity; from Base Operating Support (BOS) cost and/or personnel reductions, to RDTE management line cuts, to specific business office reductions, and the general QDR infrastructure cuts.

While some of the initiatives were started as early as FY97, the reductions they generate will continue through the out years of FY01 and FY05 as different parts of the initiatives are implemented. Reductions in laboratory and test center personnel since

the peak years can be found in Figure 2.2 below. While all of these spaces can not be considered as wholly infrastructure costs, they all contribute to the reductions.

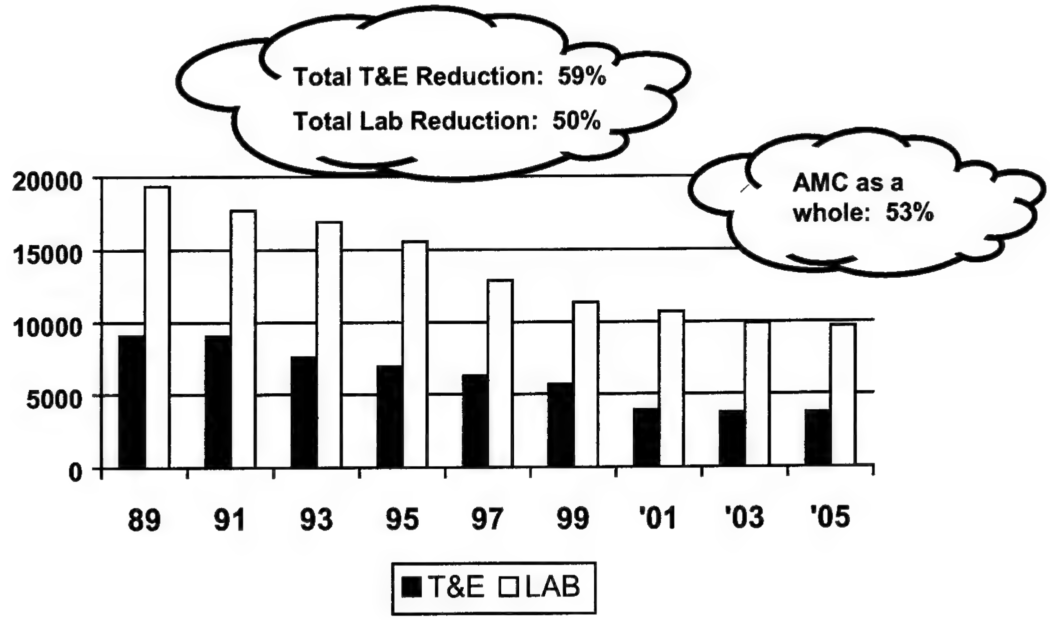


Figure 2.2 Personnel Reductions in AMC Laboratories and Test Centers since peak years of 1989/1990.

The FY96 AMC total budget (OMA and RDT&E) was $5 B. As will be articulated in the next section, AMC infrastructure cost for its labs and T&E centers for FY96 was $712 M using the CBMT data. Thus, approximately 14 percent of the total AMC budget was spent on lab and T&E infrastructure. Assuming this proportion for the peak year of FY89 in which the total AMC budget was $11.3 B, we estimate that peak year infrastructure cost was approximately $1.6 B. Comparing this figure to the figure of $712 M, we estimate AMC lab and T&E infrastructure cost has been reduced 45 percent from the peak years through FY96.

2.B Analysis of the Cost Based Management Tool Data and Identification of FY96 laboratory and T&E Center Infrastructure Costs

Following the Army methodology described in section 1 of this report, cost data has been identified for each financial category, support taxonomy, and warfighting technology area and is shown in Table 2.B1 below.

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	52664	30089	57.13%	22575	42.87%	3.17%
3.2 – Civilian Labor	1183350	888884	75.12%	294466	24.88%	41.37%
3.3 – Travel	57781	48437	83.83%	9344	16.17%	1.31%
3.4 – Contractor Services*	1489997	1342730	90.12%	147267	9.88%	20.69%
3.5 – Other Gov't Services	274887	216204	78.65%	58683	21.35%	8.24%
3.6 – Minor Equip	178174	131379	73.74%	46795	26.26%	6.57%
3.7 – Common BOS	104627			104627		14.70%
3.8 – Increment BOS	25639			25639		3.60%
3.10 – Land Use	1543			1543		0.22%
3.12 – Leased Buildings	1290	1099	85.19%	191	14.81%	0.03%
3.14 – Leased Cap Equip	1016	325	31.99%	691	68.01%	0.10%
Totals	**3370968**	**2659147**	78.9%	**711821**	21.1%	100.00%
Support Taxonomy						
Command Mgt./Admin				118613	16.66%	
Facilities Support				215193	30.23%	
Financial Mgt.				38176	5.36%	
Human Resources				22325	3.14%	
Contracts Admin.				31098	4.37%	
Supply Support				38629	5.43%	
C2 Data Systems				42160	5.92%	
Military Support Act				11107	1.56%	
Other Support				62711	8.81%	
Common BOS				104627	14.70%	
Incremental BOS				25639	3.60%	
Land Use				1543	0.22%	
Total				711821	100.00%	
Warfighting Technology Area						
Air Systems		133384	5.02%	35705		
Electronic Combat		34277	1.29%	9176		
Armaments/Munitions		906972	34.11%	242785		
Space Systems		12352	0.46%	3306		
Land Systems		399565	15.03%	106959		
Sea Systems		5425	0.20%	1452		
C4I		473713	17.81%	126807		
Corporate Technology		375617	14.13%	100548		
Other Technical		317842	11.95%	85082		
Total		**2659147**	100.0%	**711821**		

Table 2.B1 FY96 Technical and Infrastructure Support Costs. ($K)

From Table 2.B1, we can draw the following inferences:

- 62% of the infrastructure costs fall into two financial categories (civilian labor and contractor services). Note that Contractor Services should not be equated to contractor labor costs as this category includes support costs over and above the cost of the labor a contractor provides under a support contract. The ratio of infrastructure to total costs varies by type organization.

- 80% of the technical costs fall into four warfighting technology categories (armaments/munitions, land systems, C4I, and corporate technologies).

- 47% of the infrastructure costs fall into two infrastructure support categories (command management/administration and facilities support).

Based on the above information and inferences, AMC's infrastructure cost reduction goal is $71M (10% of $711821K) by FY01 and $178M (25% of $711821K) by FY05. Areas to be targeted for these reductions will be as noted in the inferences listed above.

In addition, we also analyzed the cost category of Capital Expenses that captured the original and renovation costs of buildings and capital equipment. Those figures are shown in Table 2.B2 – Capital Expenses. They are not used in the determination of an infrastructure cost baseline to establish reduction requirements in support of Section 912(c), because they represent sunk costs that are not recoverable.

Table 2.B2 – Capital Expenses – Not used in Baseline Determination

Metric	$ Spent (Acquisition & Upkeep)
Gov't Owned Buildings.	1576.1M
Gov't Owned Equipment	1176.9M

2 C – Infrastructure Cost Reductions by FY01 and FY05

As discussed in Section 2.B, AMC's infrastructure cost reduction goals are $71M by FY01 and $178M by FY05, as compared with the FY96 baseline.

Since the end of FY96 we have started initiatives that have resulted in an estimated savings to-date of about $34.421M and 360 spaces. None of these initiatives utilized the A76 process. A summary of the initiatives and the associated savings to-date, and planned, are provided in Figure 2.3 below.

Initiative	Savings (M) to-date	Spaces	Savings(M) by FY01	Spaces	Savings(M) by FY05	Spaces
BOS Cost Reductions	$1.27	10	$1.29	10	$3.43	10
RDTE Management Reductions	$10.45	175	$10.45	175	$10.45	175
Support Operations Reductions	$17.30	145	$17.30	160	$17.30	192
Other	$5.40	30	$7.40	64	$10.14	64
Totals	$34.42	360	$36.44	409	$41.32	441

Figure 2.3 Infrastructure cost Saving Initiatives from FY96 to Present

The cost reductions listed in Figure 2.3 were primarily from the Air Systems and Missile arena ($4,650K & 84 spaces), from corporate technology lines ($13,800K & 68 spaces), the C4I arena ($1400K), armaments & munitions ($10,000K & 168 spaces), and land systems ($2271K & 10 spaces). While there is some overlap within the various installations, we find that most sites show only one or two primary technology areas. We can infer that most of the proposed reduction initiatives the labs and test centers will undertake impact those primary areas.

To identify specific areas targeted for these cost reduction goals, we have taken the "support" column from Table 2.B1 and computed 10 and 25 percent reduction goals respectively as shown in Table 2.C1.

Financial Category	FY96 Infrastructure Support Costs	FY01 Reduction Goal	FY05 Reduction Goal
3.1 – Mil Labor	22575	2258	5644
3.2 – Civilian Labor	294466	29447	73617
3.3 – Travel	9344	934	2336
3.4 – Contractor Services*	147267	14727	36817
3.5 – Other Gov't Services	58683	5868	14671
3.6 – Minor Equip	46795	4680	11699
3.7 – Common BOS	104627	10463	26157
3.8 – Increment BOS	25639	2564	6410
3.10 – Land Use	1543	154	386
3.12 – Leased Buildings	191	19	48
3.14 – Leased Cap Equip	691	69	173
Totals	711821	**71182**	**177955**
Support Taxonomy			
Command Mgt./Admin	118613	11861	29653
Facilities Support	215193	21519	53798
Financial Mgt.	38176	3818	9544
Human Resources	22325	2233	5581
Contracts Admin.	31098	3110	7775
Supply Support	38629	3863	9657
C2 Data Systems	42160	4216	10540
Military Support Act	11107	1111	2777
Other Support	62711	6271	15678
Common BOS	104627	10463	26157
Incremental BOS	25639	2564	6410
Land Use	1543	154	386
Total	711821	**71182**	**177955**

Warfighting Technology Area			
Air Systems	35705	3571	8926
Electronic Combat	9176	918	2294
Armaments/Munitions	242785	24279	60696
Space Systems	3306	331	827
Land Systems	106959	10696	26740
Sea Systems	1452	145	363
C4I	126807	12681	31702
Corporate Technology	100548	10055	25137
Other Technical	85082	8508	21271
Total	711821	**71182**	**177955**

Table 2.C1 Infrastructure Support Cost Reduction Goals for FY01 and FY05 ($K)

Table 2.C1 shows the warfighting technology areas where the infrastructure cost reductions should be taken when compared to the current infrastructure costs. Space and Sea Systems infrastructure costs and reductions were too small to register on the tables and there will be no significant impact in those two areas. Table 2.C1 also identifies these reduction goals as a function of financial category. This is a statistical analysis of the data and may not be a true indication of where the reductions are eventually found. This table will be used as a guideline in researching and selecting reduction initiatives. And finally, these reduction goals are mapped against the infrastructure support areas. Again, it is a statistical breakdown of the data and will be used to indicate the most lucrative areas for infrastructure cost reductions. Statistically, land use and leased buildings were insignificant and did not register on this table. Eventually reductions will be taken in the most effective areas. AMC will evolve optimally efficient laboratories and test centers as part of our ongoing reengineering efforts and newly emerging efficiencies.

Current or planned initiatives within AMC indicate reductions can be achieved and are being planned in the areas indicated in Table 2.C2. The cost reduction initiatives' link to a specific warfighting technology area is an inferred link. In several cases, initiatives were split to show coverage in two or more technology areas.

Warfighting Technology Area	Infrastructure Cost Reduction Initiative	Planned FY01 Reductions (K)	Planned FY05 Reductions (K)
Armaments			
	BOS Cost Reductions	230	4080
	Information Management Reductions	4300	5600
	Infrastructure Streamlining	8400	18020
	Installation Logistical Process	2480	3180
	Management Reductions	9190	13400
	Facilities Energy Partnerships	400	400
	Support Business Areas Reductions		4400
	Contractor Services		1920
	Civilian Labor		8700

	Military Labor		1800
	TOTAL	**25000**	**61500**
C4I			
	BOS Cost Reductions	3900	3900
	Database Networking	600	600
	Virtual Admin Office	500	500
	Civilian Labor Reduction	6500	23500
	Military Labor Reduction	1200	2100
	Contractor Support Reduction		1100
	Power Plant Partnership		400
	Business Area Outsourcing		2400
	Contractor Support Reduction		1100
	TOTAL	**13800**	**34500**
Land Systems			
	Civilian Labor Reduction	8470	18210
	BOS Cost Reductions	620	4300
	Military Labor Reduction	710	2390
	Contractor Support Reduction	700	900
	Toxic Waste Facility Closure	500	500
	Building Closure(s)		1200
	TOTAL	**11000**	**27500**
Corp. Tech			
	Civilian Labor Reduction	4720	11730
	Contractor Support Reduction	4780	11770
	Military Labor Reduction	500	1500
	TOTAL	**10000**	**25000**
Air Sys			
	BOS Cost Reductions	400	900
	Civilian Labor Reduction	800	1800
	Contractor Support Reduction	1000	2200
	Military Labor Reduction	300	700
	Business & Operations Personnel Cuts	1500	3400
	TOTAL	**4000**	**9000**
Elect Combat			
	BOS Cost Reductions	310	610
	Civilian Labor Reduction	410	810
	Contractor Support Reduction	280	580
	TOTAL	**1000**	**2000**
Other Tech			
	Miscellaneous	6500	11500
	Business Area Outsourcing		6800
	Power Plant Partnership		200
	Total for other Tech	**6500**	**18500**
	FY01 & FY05 TOTAL ($K)	**71300**	**178000**

Table 2.C2 Planned Infrastructure Cost reductions by Warfighting Technology Areas

Infrastructure cost reduction initiatives are described in the tables in Section C of this report. Table 2.C3 is a summation of those initiatives to show a breakout of the totals by A76 actions and to show what reductions are already in the POM.

	FY01	FY05
Total Infrastructure Reductions	$71.3 M	$178 M
A76 Personnel Reductions	$14 M	$15 M
A76 Personnel Headcount	456	456
Non-A-76 Personnel Reductions	$57.3 M	$163 M
Non-A-76 Personnel Headcount	734	1815
Other Reductions		
Amount NOT in POM	$2 M	$6 M

Table 2.C3 Planned Personnel Reductions

Please note that the reduction identified in Tables 2.C1 and 2.C2 reflect total infrastructure cost reductions from FY96 to FY01 and FY05. New infrastructure reduction initiatives will be identified which target these goals LESS the amounts already achieved per Figure 2.3.

2. D – Cross-Service Infrastructure Cost Reduction Plan.

The results of the cross-service studies initiated by OSD indicate a lack of significant savings to be found in additional cross-service initiatives and no plans have been approved for implementation to date.

2. E – Conclusion

Utilizing the definition of infrastructure as approved by SAALT (see below), and the data as provided by the Cost Based Management Tool (CBMT), the FY96 infrastructure cost baseline for AMC laboratories and test centers is $711M. This figure is based on resubmitted raw data changes to the original datacall. Changes are unofficial until accepted by OSD and loaded into the official database by KPMG. Based on this figure, the cost reduction requirements for AMC should be $71M (10%) by FY01 and $178M (25%) by FY05. This baseline figure may vary due to final recognition and acceptance by OSD/KPMG or additional augmentation of the data by KPMG at the request of OSD.

While we followed the guidance to portray our reductions in terms of warfighting technology areas, we want to reemphasize that the saving initiatives are not geared to any specific technologies but to infrastructure that covers all technologies within a given site. The reductions that will be generated will be taken in the most efficient and effective areas within our installations.

We expect the approved OSD Cost-Based Management Tool data call to show an infrastructure cost for AMC Research, Development, Test and Evaluation activities in the range of $712M. Our plan shows reductions accrued to date and initiatives currently in place, or soon to be implemented, which will equate to a 10% saving by the end of

FY01. We also show planned activities that will further reduce infrastructure costs to a level 25% less than our FY96 costs by the end of FY05.

3. U. S. Army Medical Research and Materiel Command (MRMC)

3. A – Previous Infrastructure Reductions

During the period FY 90 through FY 98, USAMRMC has undergone significant downsizing, with concurrent reductions in infrastructure. Most of these reductions occurred prior to FY 96.

Site Closures

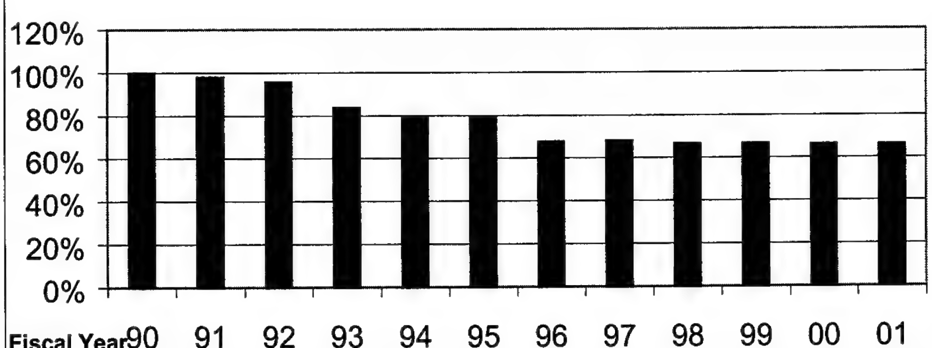
BRAC 91 resulted in the closure of three of the Army's nine medical research laboratories:
- Letterman Army Institute of Research (LAIR);
- U.S. Army Institute of Dental Research (USAIDR); and
- U.S. Army Biomedical Research and Development Laboratory (USABRDL).

In addition, several Army medical research programs were realigned, in some cases to collocate with other related Service programs.

Personnel

As shown in Figure 3.1, USAMRMC has undergone a 34% (915) reduction in the number of laboratory personnel authorizations since FY 90. Most of these reductions occurred prior to FY 96. Civilian personnel have been reduced to a greater extent than military personnel, because military authorizations have been stabilized as a result of manpower studies (OSD's 733 Study and the Quadrennial Defense Review (QDR)).

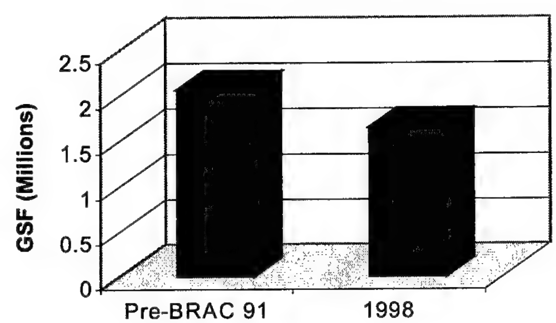
Figure 3.1 - Personnel Authorizations (% of FY 90)



Square Footage

Figure 3.2 shows the estimated gross square footage of the USAMRMC laboratories prior to BRAC 91 closures, as compared with the 1998 square footage. These reductions amount to 20% of the total Army medical laboratory footprint.

Figure 3.2 - Impact of BRAC 91 on Medical Laboratory Footprint



Cost Savings

An analysis of financial reports comparing FY88 to FY96 and CBMT data shows the following:

	FY88	FY96
Total Laboratory Budget	109,670K	110,720K
General & Admin Expenses	30,231K	17,207K
CBMT Total Budget	199,961K*	201,875K
Infrastructure Costs	86,236K*	49,084K

* FY88 CBMT Total Budget is estimated assuming the same ratio between FY96 Total Laboratory Budget and the CBMT Total Budget (55%). Likewise the FY88 Infrastructure Costs were estimated using the ratio between FY96 General and Administrative Expenses and CBMT Infrastructure Costs (35%). Based on these assumptions USAMRMC laboratories have reduced infrastructure costs 43% from FY88 to FY96.

3.B – Analysis of the Cost Based Management Tool Data and Identification of FY96 laboratory infrastructure costs.

Following the Army methodology described in section 1 of this report, cost data has been identified for each financial category, support taxonomy, and warfighting technology area and is shown in Table 3.B1 below.

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	54684	45898	83.93%	8786	16.07%	17.88%
3.2 – Civilian Labor	54400	43336	79.66%	11064	20.34%	22.52%
3.3 – Travel	3388	2729	80.55%	659	19.45%	1.34%
3.4 – Contractor Services*	28611	21144	73.90%	7467	26.10%	15.20%
3.5 – Other Gov't Services	16832	14274	84.80%	2558	15.20%	5.21%
3.6 – Minor Equip	28793	24743	85.93%	4050	14.07%	8.24%
3.7 – Common BOS	12640			12640		25.72%
3.8 – Increment BOS	1835			1835		3.73%
3.10 – Land Use	0			0		0.00%
3.12 – Leased Buildings	785	707	90.06%	78	9.94%	0.16%
3.14 – Leased Cap Equip	0	0		0		0.00%
Totals	201968	**152831**	75.7%	**49137**	24.3%	100.00%
Support Taxonomy						
Command Mgt./Admin				9980	20.31%	
Facilities Support				5142	10.46%	
Financial Mgt.				1703	3.47%	
Human Resources				1678	3.41%	
Contracts Admin.				468	0.95%	
Supply Support				6412	13.05%	
C2 Data Systems				4523	9.20%	
Military Support Act				209	0.43%	
Other Support				4547	9.25%	
Common BOS				12640	25.72%	
Incremental BOS				1835	3.73%	
Land Use				0	0.00%	
Total				49137	100.00%	
Warfighting Technology Area						
Air Systems		5074	3.32%	1631		
Electronic Combat		0	0.00%	0		
Armaments/Munitions		0	0.00%	0		
Space Systems		0	0.00%	0		
Land Systems		0	0.00%	0		
Sea Systems		0	0.00%	0		
C4I		0	0.00%	0		
Corporate Technology		141377	92.51%	45454		
Other Technical		6380	4.17%	2051		
Total		**152831**	100.0%	**49137**		

Table 3.B1 FY96 Technical and Infrastructure Support Costs. ($K)

From Table 3.B1 shown above, it is important to note the following:

- CBMT data indicates that $152,831K was spent on direct technical work and that $49,137K was spent on support to the mission.

- Contractor services should not be equated to contractor labor costs as this category includes support costs over and above the cost of the labor a contractor provides under a support contract.

- From the Financial Category metrics, USAMRMC has only partial (military labor & incremental BOS) or no control (common BOS) of 47% of the infrastructure costs identified by the CBMT.

- From the Support Taxonomy metrics once again the largest percentage of costs are the BASOPS costs.

- Based on Section 912c infrastructure guidance USAMRMC's infrastructure cost reduction targets would be $4,914K (10% of $49,137K) by FY01 and $12,284K (25% Of $49,137K) by FY05.

In addition, we also analyzed the cost category of Capital Expenses that captured the original and renovation costs of buildings and capital equipment. Those figures are shown in Table 3.B2 – Capital Expenses. They are not used in the determination of an infrastructure cost baseline to establish reduction requirements in support of Section 912c, because they represent sunk costs that are not recoverable.

Table 3.B2 - Capital Expenses - Not used in Baseline Determination

Metric	$ Spent (Acquisition & Upkeep)
Gov't Owned Buildings.	114.294M
Gov't Owned Equipment.	56.384M

3.C – Infrastructure Cost Reductions by FY01 and FY05

Looking for ways to reduce costs is a continuous process. Since FY96 USAMRMC's aggressive initiatives have already reduced infrastructure expenses by an estimated $2.611M. To identify specific areas targeted for cost reduction goals, we have taken the "support" column from Table 3.B1 and computed 10 and 25 percent reduction goals respectively as shown in Table 3.C1.

Financial Category	FY96 Infrastructure Support Costs	FY01 Reduction Goal	FY05 Reduction Goal
3.1 – Mil Labor	8786	879	2197
3.2 – Civilian Labor	11064	1106	2766
3.3 – Travel	659	66	165
3.4 – Contractor Services*	7467	747	1867
3.5 – Other Gov't Services	2558	256	640
3.6 – Minor Equip	4050	405	1013
3.7 – Common BOS	12640	1264	3160
3.8 – Increment BOS	1835	184	459
3.10 – Land Use	0	0	0
3.12 – Leased Buildings	78	8	20
3.14 – Leased Cap Equip	0	0	0
Total	49137	**4914**	**12284**
Support Taxonomy			
Command Mgt./Admin	9980	998	2495
Facilities Support	5142	514	1286
Financial Mgt.	1703	170	426
Human Resources	1678	168	420
Contracts Admin.	468	47	117
Supply Support	6412	641	1603
C2 Data Systems	4523	452	1131
Military Support Act	209	21	52
Other Support	4547	455	1137
Common BOS	12640	1264	3160
Incremental BOS	1835	184	459
Land Use	0	0	0
Total	49137	**4914**	**12284**
Warfighting Technology Area			
Air Systems	1631	163	408
Electronic Combat	0	0	0
Armaments/Munitions	0	0	0
Space Systems	0	0	0
Land Systems	0	0	0
Sea Systems	0	0	0
C4I	0	0	0
Corporate Technology	45454	4545	11364
Other Technical	2051	205	513
Total	49137	**4914**	**12284**

Table 3.C1 Infrastructure Cost Reduction Goals for FY01 and FY05 ($K)

Initiatives	Savings (M) to date	Spaces	Savings (M) by FY01	Spaces	Savings (M) by FY05	Spaces
Facilities	.078		.105		.105	
Personnel	1.654	NR	1.679	NR	1.679	NR
Management Processes	.565		3.090		3.090	
Support	.314		.905		.905	
Totals	2.611		5.779		5.779	

Figure 3.3 Infrastructure Cost Savings Initiatives From FY96 to Present

An approximation of where infrastructure savings will be taken by FY01/05 is shown in Table 3.C3 below. It is important to note the following:

- No further reductions in infrastructure expenses could be identified between FY01 and FY05 that would not result in a loss of core mission capability.

- The breakout of infrastructure saving shown under the Support Taxonomy and Warfighting Technology Area are only estimations since the data call did not ask laboratories to identify their savings by these categories.

Financial Category	FY96 Infrastructure Support costs ($K)	Planned FY01 Reductions ($K)	Planned FY05 Reductions ($K)
3.1 - Mil Labor	8786	416	416
3.2 - Civilian Labor	11064	1,263	1263
3.3 - Travel	659		
3.4 - Contractor Services	7467	2,459	2459
3.5 - Other Gov't Services	2558	27	27
3.6 - Minor Equip	4050	822	822
3.7 - Common BOS	12640		
3.8 - Increment BOS	1835	714	714
3.10 - Land Use	0		
3.12 - Leased Buildings	78	78	78
3.14 - Leased Cap Equip	0		
Totals	49137	5779	5779
Support Taxonomy			
Command Mgt./Admin	9980	2025	2025
Facilities Support	5142	105	105
Financial Mgt.	1703	210	210
Human Resources	1678	210	210
Contract Admin.	468	62	62
Supply Support	6412	1087	1087
C2 Data Systems	4523	765	765
Military Support Act	209	31	31

Other Support	4547	570	570
Common BOS	12640		
Incremental BOS	1835	714	714
Land use	0	0	0
Total	49137	5,779	5,779
Warfighting Technology Area			
Air Systems	1631	207	207
Electronic Combat	0		
Armaments/Munitions	0		
Space Systems	0		
Land Systems	0		
Sea Systems	0		
C4I	0		
Corporate Technology	45454	5312	5312
Other Technology	2051	260	260
Total	49137	5,779	5,779

Table 3.C2 Planned Infrastructure Cost Reduction Targets for FY01and FY05

Table 3.C3 below is the details of MRMC's Service Plan

Total Infrastructure Savings Dollars in Millions	FY01	FY05
A76 Personnel Reductions		
A76 Personnel Headcount		
Non-A76 Personnel Reductions	$1.679M	$1.679M
Non-A76 Personnel Headcount		
Other Reductions	$4.100M	$4.100M
Amount Not in POM		
Total	$5.779M	$5.779M

Table 3.C3 Details of MRMC's Service Plan

In summation of sections 3.B and 3.C, based on the CBMT data USAMRMC has a FY96 infrastructure baseline cost of $49,137K. In accordance with Section 912c infrastructure reduction guidance, this organization's 10% (FY01) and 25% (FY05) targets (based on a $49,137K baseline) would be $4,908K and $12,284K. The current estimated savings of $5.779M meets 118% of the 10% reduction by FY01. The additional $6.505M required to meet the 25% by FY05 is not attainable without a loss of core mission capabilities.

3.D – Cross-Service Infrastructure Cost Reduction Plan

The results of the cross-service studies initiated by OSD indicated a lack of significant savings to be found in additional cross-service initiatives and no plans have been approved for implementation to date.

3.E - Conclusion

As measured by the CBMT, USAMRMC laboratories anticipate an estimated 11.8% reduction in infrastructure expenses by FY01, relative to the FY96 baseline year. These savings, half of which have already been achieved, result from a combination of reductions in facilities and capital equipment, increased efficiency of support services, enhanced management processes, and reductions in general and administrative personnel. No further reductions in infrastructure expenses could be identified between FY 01 and FY 05 that would not result in a loss of core mission capability.

A significant portion of infrastructure costs included in the CBMT are not under the complete control of RDT&E managers. USAMRMC's subordinate activities, as tenants on installations owned by others, have no control over the cost of common level base operating support. Similarly, USAMRMC managers have only partial control over incremental level base operating support costs and the cost of military labor. The 11.8% infrastructure savings that are projected by USAMRMC through FY 05 represent 22.4% of the RDT&E funded portion of infrastructure that is actively managed by USAMRMC. Thus, MRMC's initiatives to control infrastructure costs clearly approach the 912c target when only costs under MRMC control are considered.

Not considered in the CBMT are USAMRMC initiatives to improve technical work management processes from FY98 to FY01 that will also make available approximately $3.030M in direct science dollars. These funds will be reinvested into science projects, as they become available.

Owing to a number of factors that generate sustained or increasing requirements for infrastructure, reductions in infrastructure expenses beyond the 11.8% already identified are not advisable. The remainder of this discussion highlights these factors.

<u>Actions taken prior to FY 96</u>

Throughout the last decade, USAMRMC has sought to prudently reduce managerial and support staff and achieve management efficiencies in order to preserve, when possible, essential scientific and engineering capability. Consistent with this strategy (and subject to the caveats identified above), the preliminary CBMT data suggest that the portion of total cost that goes toward overhead expenses at medical research laboratories is, on average, approximately 16% lower than that for the other Army laboratories combined. Reductions in support staff have, however, shifted a greater administrative burden onto in-house researchers. In the absence of mission relief and authority to reduce associated scientific and engineering capabilities, additional reductions in support staff will seriously compromise R&D productivity through

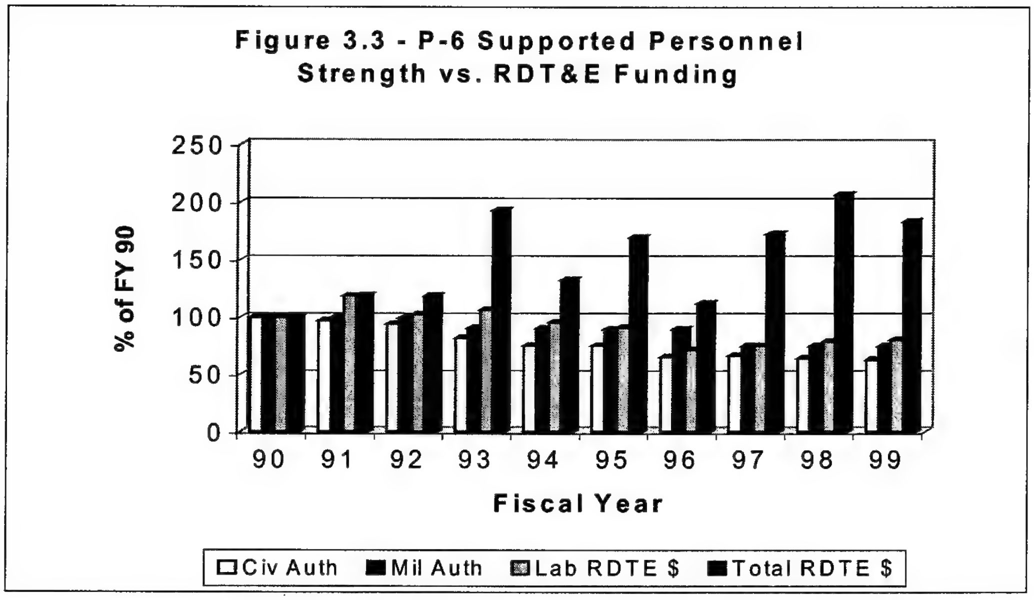
inadequate support and further diversion of researchers from their scientific responsibilities.

Mission Increases

USAMRMC missions, both RDT&E and otherwise, have continued to increase over the past decade, and this pressure on the infrastructure is expected to continue into the foreseeable future. While research remains the primary laboratory mission, certain elements of the medical laboratory infrastructure that are captured in the CBMT must also serve training, education, health surveillance, patient care, and other missions. It is notable that USAMRMC has thus far been able to fulfill its increased responsibilities without commensurate increases in laboratory infrastructure. As examples:

- Despite an overall decline in medical RDT&E funding over the past several years, there has been a recent sharp increase in emphasis on medical biological defense. Program Decision Memorandum 1 on the FY 00-05 POM directed an increase in both funding and personnel authorizations, which, by FY05, will increase the medical biological defense program's science and technology funding by 73%, and will increase the number of authorized personnel at the lead laboratory, the U.S. Army Medical Research Institute for Infectious Diseases (USAMRIID) by 13%, relative to FY98 levels.

- Congressional-directed increases in funding have continued to impact on medical RDT&E. USAMRMC has managed these increases without increases to lab infrastructure by outsourcing the majority of special interest funds to universities and other private sector institutions. As shown in Figure 3.3, RDT&E funding for the core mission-related programs of USAMRMC has fallen over the past decade, with in-house (lab RDTE) funding falling roughly in parallel with overall personnel strength. However, the overall (total) RDT&E funding executed by USAMRMC has risen, primarily due to congressional special interest programs. In certain cases, the goals of Congress are best served by exploiting in-house facilities and personnel, and portions of special interest funding are executed intramurally, with resultant infrastructure requirements. Examples of the latter include the Defense Women's Health Research Program and, more recently, funding for research into the health effects of chronic low-dose chemical agent exposure.



- Presidential Decision Directive NSTC-7 expanded the mission of the DoD in June of 1996 to include support of global surveillance, training, research and response to emerging infectious disease threats. Walter Reed Army Institute of Research (WRAIR) is the Central Hub of the DoD Global Emerging Infection Surveillance and Response System (GEIS). This is a prime example of a leveraged non-RDTE mission that exists in S&T labs because of the existing infrastructure.

- The U.S. Army Medical Research Institute for Chemical Defense (USAMRICD) and USAMRIID have increasingly provided R&D support for education and training of military medical and non-medical personnel in principles and techniques for field management of chemical and biological casualties. Likewise, these labs are called upon to support education and training of civilian emergency medical personnel to enhance domestic preparedness against terrorist acts. USAMRICD and USAMRIID also are requested to provide consultation and guidance on the medical effects of chemical and biological agents throughout DoD, as well as to civilian Federal and local emergency response agencies such as the Federal Emergency Management Agency. Again, a mission that leverages S&T infrastructure.

- In addition to their core missions in discovery and development of medical countermeasures for military health threats, USAMRMC laboratories are called on to undertake research to explore special issues for the DoD. Examples of these include efforts to identify underlying causes of Gulf War Illness, and exploration of the effects of low dose chemical agent exposures. In addition, USAMRMC laboratories continue to support operational deployments and other operational needs on a contingency basis with deployable rapid response teams that provide medical consultation, establishment of diagnostic laboratories, support to field epidemiological studies, and patient isolation, transport and care.

Increased Administrative Burden

Finally, changes in the DoD organizational and policy environment over the past decade have resulted in increased and continuing administrative burdens, with consequent pressure on infrastructure costs. Examples of these impacts include:

- Reporting requirements have increased in several arenas over the past decade, involving laboratory personnel in information gathering and planning processes. These include new strategic plans arising from Tri-Service Reliance (i.e., Joint Warfighting Science and Technology Plan, Defense Technology Plan, and Basic Research Plan), and an Annual DoD Report to Congress on Animal Use.

- Transfer of responsibility for advanced development of biological defense vaccines from USAMRMC to the Joint Program Office for Biological Defense (JPO-BD) has created new matrix management/support requirements between USAMRIID and JPO-BD to ensure effective transition of products to advanced development.

- The DoD 5000 series regulations require strengthening of communications and linkages between the research and user communities, necessitating increased travel for meetings and briefings.

- The Defense Acquisition Workforce Improvement Act (DAWIA) has increased requirements for education and training of laboratory personnel.

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4. U.S. Army Corps of Engineers (USACE)

4. A – Previous Infrastructure Reductions - Peak Year to FY96

During the OSD peak years of 1992-1996, USACE R&D Laboratories have undertaken a series of cost reduction initiatives and re-engineering efforts that effected infrastructure manpower and cost reductions even as programs were continuing to increase. As shown in Table A1 below, the USACE Total R&D program (including all funding sources) increased by 20% from FY92 to FY96, while the RDTE program increased by 22% during the same period:

Funding Source	FY92 ($,M)	FY96 ($,M)
RDTE	233	285
OMA	47	41
Civil Works	121	154
Total	**401**	**480**

TABLE 4.1 USACE Funding by Source, FY92 - FY96

Even though USACE R&D was not involved with any BRAC actions, our infrastructure costs and manpower decreased during this period through our proactive efforts to increase the efficiency of the USACE R&D Laboratories. As shown in Table 4.2 below, the USACE Total R&D Manpower (including all funding sources) decreased by 8% from FY92 to FY96, even as our program was growing and putting more demands on our infrastructure. Our RDTE manpower decreased by 14% during this same period:

Funding Source	FY92 FTE	FY96 FTE)
RDTE	1677	1450
OMA	151	196
Civil Works	894	854
Total	**2722**	**2500**

TABLE 4.2 USACE Manpower by Funding Source, FY92 - FY96

By FY96, our total USACE R&D Laboratory Infrastructure of $49.5M as reported on the CBMT Data Call had been reduced to 10% of the total program that it was supporting.

4.B – Analysis of the Cost Based Management Tool Data and Identification of FY96 laboratory and T&E Center Infrastructure Costs

Following the Army methodology described in section 1 of this report, cost data has been identified for each financial category, support taxonomy, and warfighting technology area and is shown in Table 4.B1 below.

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	1616	1056	65.35%	560	34.65%	1.13%
3.2 – Civilian Labor	121048	101312	83.70%	19736	16.30%	39.82%
3.3 – Travel	11251	10531	93.60%	720	6.40%	1.45%
3.4 – Contractor Services*	102976	100298	97.40%	2678	2.60%	5.40%
3.5 – Other Gov't Services	78089	66857	85.62%	11232	14.38%	22.66%
3.6 – Minor Equip	28025	20880	74.50%	7145	25.50%	14.42%
3.7 – Common BOS	5858			5858		11.82%
3.8 – Increment BOS	0			0		0.00%
3.10 – Land Use	333			333		0.67%
3.12 – Leased Buildings	2332	1104	47.34%	1228	52.66%	2.48%
3.14 – Leased Cap Equip	87	17	19.54%	70	80.46%	0.14%
Totals	351615	**302055**	85.9%	**49560**	14.1%	100.00%
Support Taxonomy						
Command Mgt./Admin				13664	27.57%	
Facilities Support				7930	16.00%	
Financial Mgt.				4827	9.74%	
Human Resources				3343	6.75%	
Contracts Admin.				2993	6.04%	
Supply Support				1274	2.57%	
C2 Data Systems				7396	14.92%	
Military Support Act				0	0.00%	
Other Support				1942	3.92%	
Common BOS				5858	11.82%	
Incremental BOS				0	0.00%	
Land Use				333	0.67%	
Total				49560	100.00%	
Warfighting Technology Area						
Air Systems		0	0.00%	0		
Electronic Combat		0	0.00%	0		
Armaments/Munitions		0	0.00%	0		
Space Systems		0	0.00%	0		
Land Systems		195	0.06%	32		
Sea Systems		621	0.21%	102		
C4I		73180	24.23%	12007		
Corporate Technology		228059	75.50%	37419		
Other Technical		0	0.00%	0		
Total		**302055**	100.0%	**49560**		

Table 4.B1 FY96 Technical and Infrastructure Support Costs. ($K)

From Table 4.B1, we can draw the following inferences:

- 63% of the infrastructure costs fall into two financial categories (civilian labor and other government services).

- 99+% of the technical costs fall into two warfighting technology categories (C4I and corporate technologies).

- 43% of the infrastructure costs fall into two infrastructure support categories (command management/administration and facilities support), with an additional 15% falling into C2 data systems.

Based on the above information and inferences, USACE's infrastructure cost reduction goal is $5M (10% of $49560K) by FY01 and $12.4M (25% of $49560K) by FY05. Areas to be targeted for these reductions will be as noted in the inferences listed above.

In addition, we also analyzed the cost category of Capital Expenses that captured the original and renovation costs of buildings and capital equipment. Those figures are shown in Table 4.B2 – Capital Expenses. They are not used in the determination of an infrastructure cost baseline to establish reduction requirements in support of Section 912(c), because they represent sunk costs that are not recoverable.

Table 4.B2 – Capital Expenses – Not used in Baseline Determination

Metric	$ Spent (Acquisition & Upkeep)
Gov't Owned Buildings.	117.2M
Gov't Owned Equipment	47.3M

4.C – Infrastructure Cost Reductions by FY01 and FY05

As discussed in Section 4.B, USACE's infrastructure cost reduction goals are $5M by FY01 and $12.4M by FY05, as compared with the FY96 baseline. USACE will re-engineer the four USACE R&D Laboratories into a single organization, the US Army Engineer Research and Development Center. This new organization will operate as a single command function across the four, current geographic sites with consolidated business functions and streamlined business practices.

Financial Category	FY96 Infrastructure Support Costs	FY01 Reduction Goal	FY05 Reduction Goal
3.1 – Mil Labor	560	56	140
3.2 – Civilian Labor	19736	1974	4934
3.3 – Travel	720	72	180
3.4 – Contractor Services*	2678	268	670
3.5 – Other Gov't Services	11232	1123	2808
3.6 – Minor Equip	7145	715	1786
3.7 – Common BOS	5858	586	1465
3.8 – Increment BOS	0	0	0
3.10 – Land Use	333	33	83
3.12 – Leased Buildings	1228	123	307
3.14 – Leased Cap Equip	70	7	18
Total	49560	**4956**	**12390**
Support Taxonomy			
Command Mgt./Admin	13664	1366	3416
Facilities Support	7930	793	1983
Financial Mgt.	4827	483	1207
Human Resources	3343	334	836
Contracts Admin.	2993	299	748
Supply Support	1274	127	319
C2 Data Systems	7396	740	1849
Military Support Act	0	0	0
Other Support	1942	194	486
Common BOS	5858	586	1465
Incremental BOS	0	0	0
Land Use	333	33	83
Total	49560	**4956**	**12390**
Warfighting Technology Area			
Air Systems	0	0	0
Electronic Combat	0	0	0
Armaments/Munitions	0	0	0
Space Systems	0	0	0
Land Systems	32	3	8
Sea Systems	102	10	25
C4I	12007	1201	3002
Corporate Technology	37419	3742	9355
Other Technical	0	0	0
Total	49560	**4956**	**12390**

Table 4.C1 Infrastructure Cost Reduction Goals for FY01 and FY02 ($K)

Financial Category	Planned FY01 Reduction ($M)	Planned FY05 Reduction ($M)
3.1 – Mil Labor		
3.2 – Civilian Labor	4.8	10.8
3.3 – Travel		
3.4 – Contractor Services	0.7	1.2
3.5 – Other Gov't Services		
3.6 – Minor Equip		
3.7 – Common BOS		
3.8 – Increment BOS		
3.10 – Land Use		
3.11 – Gov't Owned Buildings		
3.12 – Leased Buildings	0.3	0.6
3.13 – Gov't owned Cap Equip		
3.14 – Leased Cap Equip		
Totals	**5.8**	**12.6**
Support Taxonomy		
Command Mgt./Admin	1.6	3.4
Facilities Support	0.9	2.0
Financial Mgt.	0.5	1.1
Human Resources	0.4	0.9
Contracts Admin.	0.4	0.8
Supply Support	0.2	0.4
C2 Data Systems	0.8	1.9
Military Support Act		
Other Support	0.2	0.5
BASOPS (3.7 & 3.8)	0.7	1.5
Land Use (3.10)	0.1	0.1
Total	**5.8**	**12.6**
Warfighting Technology Area		
Air Systems		
Electronic Combat		
Armaments/Munitions		
Space Systems		
Land Systems		
Sea Systems		
C4I	1.2	2.6
Corporate Technology	4.6	10.0
Other Technical		
Total	**5.8**	**12.6**

Table 4.C2 Planned Infrastructure Cost Reduction for FY01 and FY05

DETAIL OF USACE SERVICE PLAN

INFRASTRUCTURE STREAMLINING – (FY96 Dollars in Millions)

Re-Engineer the four USACE R&D Labs (CERL, CRREL, TEC & WES) into a single organization, US Army Engineer Research and Development Center (USAERDC), operating across the four, current geographic sites. This will create a single command function, consolidate business functions, and streamline business practices.	FY01	FY05
Total Infrastructure Savings		
A76 Personnel Savings	None	None
A76 Personnel Headcount	None	None
Non-A-76 Personnel Savings	$4.760	$10.800
(Army RDTE Direct)	$(2.260)	$4.200
(Army Reimbursable)	$(1.100)	$(3.900)
(Army Civil Works)	$(1.400)	$(2.700)
Non-A-76 Personnel Headcount (Civilian FTE)	2171	2009
(Army Military-Funded Civilian FTE)	(1424)	(1306)
(Army Civil Works Civilian FTE)	(747)	(703)
Other Savings (USACE R&D Facilities Savings – Army RDTE Direct)	$1.040	$1.800
Amount NOT in POM (Total New Infrastructure Savings)	$5.800	$12.600

TABLE 4.C3 USACE Detailed Service Plan for Infrastructure Streamlining

The USACE R&D Laboratory Infrastructure is funded with a mix of Army RDTE Direct, Army Reimbursable, and Army Civil Works Funding. The Savings are thus broken down into the same components, to indicate the funding source that will realize the actual savings.

The Personnel Headcount at the four USACE R&D Labs is comprised of Military-Funded and Civil Works-Funded civilian FTE, and these components are broken out in the spreadsheet above.

4. D – Cross-Service Infrastructure Cost Reduction Plan.

The results of the cross-service studies initiated by OSD indicate a lack of significant savings to be found in additional cross-service initiatives and no plans have been approved for implementation to date.

4. E – Conclusion

The USACE Section 912c Infrastructure Streamlining Plan achieves the 10% savings goal for FY01 and the 25% savings goal for FY05. None of these reductions are currently in the POM. It is important to note that both the USACE R&D Laboratory Infrastructure and the projected savings are a mix of Army RDTE Direct, Army Reimbursable, and Army Civil Works Funded. Thus the savings can not all be subtracted from the RDTE Direct Funded line – rather they must be apportioned to the appropriate funding lines.

5. U.S. Army Space & Missile Defense Command

5.A: Previous Infrastructure Savings Peak-Year to FY96.

From the peak year (FY92) to FY96, USASMDC has undertaken numerous cost reduction measures and savings efficiencies. Most notably effected during this timeframe was the U.S. Army Kwajalein Atoll (USAKA). From FY90 to FY96, USAKA was the subject of many internal/external reviews, studies, and audits. As a result, USAKA has streamlined its operational requirements to permit maximum Range utilization at a minimal funding level. A summary of those reviews, studies, and audits are as follows:

In 1993, following the FY94 POM submittal review, HQDA initiated a TECOM effort to determine whether Kwajalein Missile Range (KMR) could be operated at less cost and whether TECOM could play a role in reducing the cost of KMR operations. Following their visit, TECOM concluded that USAKA/KMR operations could potentially save 10% through cost reduction measures and direct customer reimbursements (DCR's) offsets. In response, the USASSDC Commanding General directed the USASSDC Deputy Commanding General to assemble a high-level team of functional area experts from government and industry to conduct a zero-based review of the USAKA operations with the objective to seek approaches to reduce costs without loss of mission effectiveness. The results of the review included increasing reimbursements by 50% between 1994 and 1999 while reducing costs by 25% without affecting performance on user requirements.

In 1994, the USASSDC Commanding General directed the USASSDC Chief of Staff to conduct an independent study to determine if the cost of operations at USAKA could be further reduced. The 1994 study was conducted as a follow-on effort to the 1993 zero-based review. The study team recommended to the CG to restructure and refine the USASSDC/USAKA organizational and responsibility relationship, decrease the government/contractor on-island workforce by relocating specific functions to CONUS, and implement additional cost savings initiatives to reduce contractor operational budgets.

In 1996, DUSA (OR) initiated a study to consider the possible consolidation of Army test and evaluation into a single Army Test and Evaluation Command at Fort Bliss, Texas by 2000. Included in the study was the transition of USAKA responsibilities to TECOM. Neither option was recommended or implemented.

In 1996, the Assistant Chief of Staff for Installation Management conducted a TDA equipment review. The review determined there was no excess equipment on the island and recommended 12 additional items (heavy equipment/vehicles) were needed.

In 1996, U.S. Army Audit Agency performed a Direct Cost Reimbursement (DCR) review focusing on processes within the USAKA's DCR program, the reasonableness of rates charged to mission customers, and whether all applicable FY95 mission costs

were passed on to USAKA customers. Results of AAA's review was that USAKA had an adequate allocation process for applying mission costs to the DCR program, recommended POM be restored for fixed costs, and DCR rates could be moderately increased.

As a result of these reviews, studies and audits, in four years USAKA was able to implement over $49.0M of cost reduction initiatives, a 26% reduction to its FY92 operational budget (see figure 5.1).

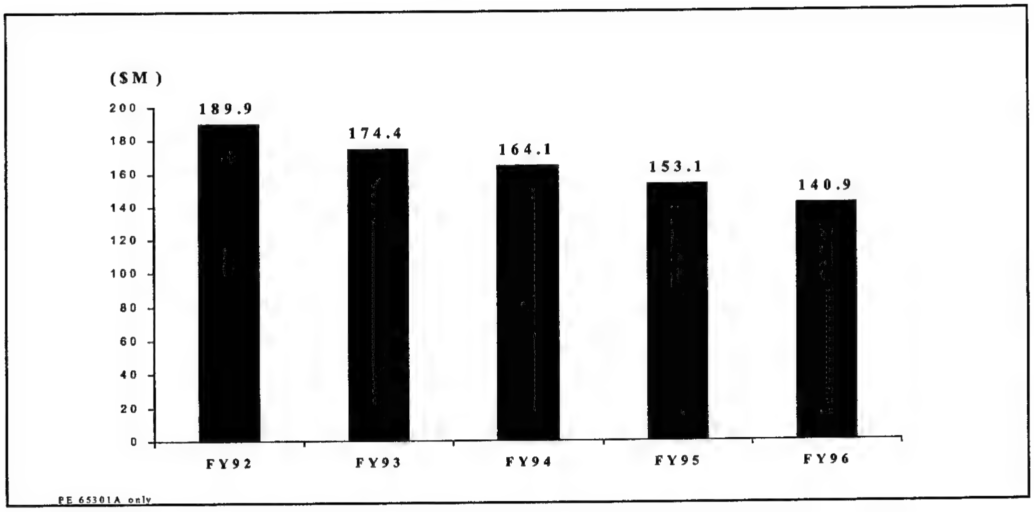

Figure 5.1 USAKA Operational Budget Since FY92

A summary of all the cost reduction efforts that were implemented from FY92 to FY96 were:

- Consolidation/reduction of contract effort;
- Consolidation of mission control centers;
- Caretaker status for Meck Island;
- Reduction of MIT/LL (FFRDC contractor) Staff;
- Reduction of Range data reduction through consolidation of functions;
- Reduction of government staff positions;
- Reorganization of USAKA/KMR;
- Reduced Logistics contractor work force by 20%;
- Reduced Range contractor and MIT/LL budget $1.0M;
- Reduced contractor family housing by 180;
- Reduced infrastructure/maintenance;
- Restructured medical fees;
- Reduced outer island work week to 4 days;
- Reduced Roi commuter flights;
- Eliminated 50 trailers.

5.B: Analysis of the Cost Based Management Tool data and Identification of Infrastructure Costs

Following the Army methodology described in section 1 of this report, cost data has been identified for each financial category, support taxonomy, and warfighting technology area and is shown in Table 5.B1 below.

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	3228	1022	31.66%	2206	68.34%	1.74%
3.2 – Civilian Labor	27236	16111	59.15%	11125	40.85%	8.76%
3.3 – Travel	2345	1346	57.40%	999	42.60%	0.79%
3.4 – Contractor Services*	428681	362717	84.61%	65964	15.39%	51.92%
3.5 – Other Gov't Services	149433	141667	94.80%	7766	5.20%	6.11%
3.6 – Minor Equip	29312	10541	35.96%	18771	64.04%	14.78%
3.7 – Common BOS	3559			3559		2.80%
3.8 – Increment BOS	388			388		0.31%
3.10 – Land Use	14034			14034		11.05%
3.12 – Leased Buildings	2214	0	0.00%	2214	100.00%	1.74%
3.14 – Leased Cap Equip	18	3	16.67%	15	83.33%	0.01%
Totals	660448	**533407**	80.8%	**127041**	19.2%	100.00%
Support Taxonomy						
Command Mgt./Admin				17123	13.48%	
Facilities Support				51222	40.32%	
Financial Mgt.				1001	0.79%	
Human Resources				477	0.38%	
Contracts Admin.				544	0.43%	
Supply Support				28709	22.60%	
C2 Data Systems				4115	3.24%	
Military Support Act				0	0.00%	
Other Support				5869	4.62%	
Common BOS				3559	2.80%	
Incremental BOS				388	0.31%	
Land Use				14034	11.05%	
Total				127041	100.00%	
Warfighting Technology Area						
Air Systems		0	0.00%	0		
Electronic Combat		0	0.00%	0		
Armaments/Munitions		526777	98.76%	125462		
Space Systems		4781	0.90%	1139		
Land Systems		0	0.00%	0		
Sea Systems		0	0.00%	0		
C4I		0	0.00%	0		
Corporate Technology		1849	0.35%	440		
Other Technical		0	0.00%	0		
Total		**533407**	100.0%	**127041**		

Table 5.B1 FY96 Technical and Infrastructure Support Costs. ($K)

From Table 5.1, we can draw the following inferences:

- 80.8% of the costs are associated with technical work performed
- 19.2% are infrastructure costs
- Over 94.6% or $504.4M technical work is for Contract and Other Government Agency support.
- For infrastructure work, the cost drivers are spread mainly among 4 resource categories: Contractor Support (51.9%); Minor Equipment, Materials, Supplies (14.8%); Land Use (11.0%), and Civilian Labor (8.8%).

Excluded from the Infrastructure Cost Total are: (1) 3.11 – Government Owned Buildings and 3.13 – Government Owned Capital equipment. These costs represent "sunk" costs that can not be reduced without BRAC authority; (2) USAKA's "Other Work" Product Taxonomy category ($16.5M). The work is associated with Kwajalein's space surveillance effort in support of CINCSPACE's operational mission. It is not research, develop, testing or evaluation as defined in the Infrastructure definition).

5.C: Infrastructure Cost Reductions for FY01 and FY05.

Financial Category	FY96 Infrastructure Support Costs	FY01 Reduction Goal	FY05 Reduction Goal
3.1 – Mil Labor	2206	221	552
3.2 – Civilian Labor	11125	1113	2781
3.3 – Travel	999	100	250
3.4 – Contractor Services*	65964	6596	16491
3.5 – Other Gov't Services	7766	777	1942
3.6 – Minor Equip	18771	1877	4693
3.7 – Common BOS	3559	356	890
3.8 – Increment BOS	388	39	97
3.10 – Land Use	14034	1403	3509
3.12 – Leased Buildings	2214	221	554
3.14 – Leased Cap Equip	15	2	4
Total	127041	**12704**	**31760**
Support Taxonomy			
Command Mgt./Admin	17123	1712	4281
Facilities Support	51222	5122	12806
Financial Mgt.	1001	100	250
Human Resources	477	48	119
Contracts Admin.	544	54	136
Supply Support	28709	2871	7177

C2 Data Systems	4115	412	1029
Military Support Act	0	0	0
Other Support	5869	587	1467
Common BOS	3559	356	890
Incremental BOS	388	39	97
Land Use	14034	1403	3509
Total	127041	12704	31760
Warfighting Technology Area			
Air Systems	0	0	0
Electronic Combat	0	0	0
Armaments/Munitions	125462	12546	31365
Space Systems	1139	114	285
Land Systems	0	0	0
Sea Systems	0	0	0
C4I	0	0	0
Corporate Technology	440	44	110
Other Technical	0	0	0
Total	127041	**12704**	**31760**

Table 5.C1 Infrastructure Cost Reduction Goals for FY01 and FY05 ($K)

Current and planned initiatives are indicated in Table 5.C2.

Warfighting Technology Area	Infrastructure Cost Reduction Initiative	Planned FY01 Reductions ($K)	Planned FY05 Reductions ($K)
Armaments			
	Civilian Labor Reductions	3740	3740
	Cost Reduction/Technical Excellence Initiatives	900	900
	Food Services Efficiencies	200	200
	Aviation Reductions/Efficiencies	580	580
	Environmental Project Reductions	3100	3100
	Information Management Services	1540	1540
	Kwajalein Sensor Study	2000	2000
	Consolidated On-Site Contracts	2872	2872
	Kwajalein Modernization and Remoting		8520
	Move to Redstone Arsenal		1900
	TOTAL	**16632**	**27052**
Space Systems			
	Consolidated On-Site Contracts	246	246
	TOTAL	**246**	**246**
Corporate Tech			
	Consolidated On-Site Contracts	82	82
	TOTAL	**82**	**82**

	FY01 & FY05 TOTAL	16960	27380

Table 5.C2 Infrastructure Reduction Plan

Table 5.C3 is a summation of those initiatives to show a breakout of the totals by A76 actions and to show what reductions are already in the POM.

	FY01	FY05
Infrastructure Streamlining (FY 96 $(K))		
Total Infrastructure Savings	**$16960**	**$27380**
A76 Personnel Savings		$799
A76 Personnel Headcount	0	7
Non-A-76 Personnel Savings		
Non-A-76 Personnel Headcount		
Other Reductions		$26,581
Amount not in POM	0	0

Table 5.C3 Planned Personnel Reductions

The plans shown in Tables 5.C2 and 5.C3 above indicate a short fall of approximately $4.4M in meeting the FY05 goal of $31.8M. Details of the reduction plans and this shortfall will be discussed in the following paragraphs.

To meet the FY05 25% requirement, the majority of the savings will come from the Kwajalein Modernization and Remoting (KMAR). Implemented in FY97, KMAR is an innovative, comprehensive 5-year plan to modernize Kwajalein Missile Ranges aging technical infrastructure by replacing unique one-of-a-kind instrumentation systems with common sub-systems, receivers, signal processing, computer and data recording systems as well as maximizing the use of commercial off-the-self (COTS) components. As a result of this modernization and remoting effort, USAKA will substantially reduce technical staffing, eliminate daily fixed-wing aircraft commute, reduce outer-island helicopter flights and significantly decrease the O&M costs of USAKA's suite of sensors and radars. Total savings expected from this initiative is $17.7M by FY03; however, only 48.1% or $8.52M will be infrastructure savings.

In addition to KMAR, in FY98, USASMDC conducted an extensive review of USAKA's suite of sensors. Called the Kwajalein Sensor Study (KSS), its purpose was to determine customer needs and identify the most cost effective array(s) of sensors (radar, optics, and telemetry) at the Kwajalein Missile range (KMR) to meet short-term and long-term user requirements. The results of the study determined that based on user needs/requirements, all the sensors and radars were mission critical except for the FPQ-19 (estimated savings of $2.0M). Also, the study team recommended USASMDC conduct a Bottom-up Logistics Study using the results of the KSS to establish a logistics/BASOPS baseline. USASMDC has considered this recommendation and has created a Process Action Team (PAT) to look into this area.

Another cost reduction effort USASMDC implemented since FY96 was the HELSTF Reengineering and Streamlining effort. In FY97, to streamline HELSTF's operations, USASMDC:

1. Consolidated all site redundant operations under one contractor (purchasing, shipping, warehousing, receiving);
2. Eliminated all Navy contracts and consolidated the work under USASMDC contracts;
3. Eliminated on-site support services;
4. Downsized the prime contractor and compensated with cross-training and longer lead times;
5. Decreased government civilian personnel from 14 to 10.

The total savings realized from this endeavor was over $10.7M. Of the $10.7M, only 30% or $3.2M was infrastructure savings.

USASMDC also implemented savings initiatives for MDSTC. In FY97, USASMDC reduced personnel authorizations and consolidated MDSTC and PEO Air Missile Defense personnel reducing facility requirements for USASMDC. Savings realized as a result of these actions was over $4.0M.

Bottom line, USASMDC will be able to meet the FY01 requirement, however, we will have some difficulty achieving the FY05 requirement. Since over $9.0M of USAKA's KMAR savings and $7.0M of HELSTF's savings can not be included, per the infrastructure definition, USASMDC will have an infrastructure savings shortfall of about $4.4M. However, we are aggressively pursuing USAKA's Bottom-up Logistics Study in hopes of identifying other potential area's we can tap to reduce this shortfall.

5.D: Recommendations for Cross-Service savings.

After careful consideration, USASDMC does not have any cross-service recommendations at this time.

5.E: Discussion points concerning the difficulty in executing the 10% and 25% reductions and the impact these reductions will have on USASMDC sites.

USAKA/KMR:

- As a result of current congressional reductions (to USAKA's FY98 and FY99 budget) USAKA/KMR was forced to defer critical repairs to an already failing infrastructure and has further delayed the purchase of mission essential capital equipment. In addition, the highly corrosive environmental conditions at USAKA/KMR will continue to accelerate the deterioration of the existing infrastructure. Further reductions will only exacerbate this problem which could

inevitably affect USAKA's ability to operate effectively as a missile range and test facility base.

- MAJOR ON-GOING EFFORTS: In the last couple of years, USASMDC has continued to evaluate ways to reduce cost while maintaining mission reliability. Three of the major on-going efforts are:
  - Cost reduction/Technical Excellence (CR/TE) – The purpose of this effort is to incentivize contractors through a fee process, improve government cost accounting, empower managers to be more accountable for their program budget planning and execution.
  - Kwajalein Sensor Study (KSS) – The purpose of this study was to determine how well existing sensors were meeting Kwajalein's current and future customer needs and determine what sensor(s) could be eliminated without severely impacting mission requirements and reduce the cost to maintain and operate KMR.
  - Kwajalein Modernization and Remoting (KMAR) – The purpose of this five-year project focused on reducing the cost to operate and maintain KMR's suite of radars and sensors. Because of a lack of upfront investment funds and FY98/99 congressional reductions, KMAR savings of $17.7M has slipped from FY02 to FY03.

- FY01-05 POM ISSUES:
  - The Kwajalein Modernization and Remoting (KMAR) project was originally slated to save $12.2M in FY01 and $17.7M in FY02 and out. The FY98 and FY99 congressional reductions and outside investment shortfalls have resulted in a completion delay of over one year, with projected savings not being achieved until FY03. As a result, O&M costs for existing sensors and instrumentation remains at very high levels.

  - FY00-05 arbitrary inflation adjustment (PBD 602, 604, 606) of $23.5M will result in an O&M "death spiral". To stop this "death spiral", a total increase of $97M is required in FY01-05. This increase will enable USAKA/KMR to complete the KMAR project, repair/replace failing facilities and inoperable equipment, and sustain minimum essential MRTFB operations in FY01 and out. If not funded, we will be unable to operate and sustain the range, risking CINSPACE space surveillance and Theater and National Missile Defense test missions.

  - If these funding problems persist, the only alternative will be to implement hardship, unaccompanied tour policies resulting in USAKA/KMR's inability to recruit and retain qualified personnel.

- USASMDC has made every attempt to implement operational efficiencies to reduce costs at USAKA. To continue this trend, USASMDC plans to conduct a Bottoms-Up Logistics Study based on the results of the KSS. We hope by taking this approach, we will be able to identify other untapped area's that will further decrease the cost to

operate at USAKA. However, with all these cost savings initiatives, USAKA may still not meet the FY05 cost reduction requirement. Even though USAKA will save over $17.7M with the completion of the KMAR, only half of the savings will apply to infrastructure as defined in the 912(c) Study.

MDSTC: FY05 savings reductions is contingent on USASMDC-Huntsville moving onto Redstone Arsenal, eliminating costs associated with the lease.

6. U.S. Army Operational Test and Evaluation Command (OPTEC)

6. A – Previous Reductions

Below are a series of cost reduction initiatives and redesigns that OPTEC has undergone.

In FY92 OPTEC was assessed several manpower reductions as part of Army/DoD initiatives: 25 civilian spaces for Quicksilver, three civilian spaces for DMR 945U (Software Engineering), one civilian space for DMR 945Q (Consolidation of Mail), four civilian spaces for D9D attrition reduction, 53 civilian spaces for PBD 725 (civilian end-strength reduction), 33 officer and 38 enlisted spaces for the OPTEC concept plan reduction, and three officer and 31 civilian spaces for a reduction planned for OTEA before establishing OPTEC.

In FY93 three additional spaces were reduced for Quicksilver, one officer space was transferred to TEMA, and an additional OTEA reduction of three officers and four civilians were taken.

In FY94 OPTEC began an aggressive drawdown called OPTEC 2000. Fifty officer and 60 enlisted spaces were reduced.

In FY95 the OPTEC 2000 plan reduced 31 officer, 97 enlisted and six civilian positions.

In FY96 51 civilian spaces were reduced for OPTEC 2000. OPTEC 2000 called for relocation of the Operational Evaluation Command to Ft Hood, Texas. The co-location with TEXCOM would have eliminated the need for a support staff for the Operational Evaluation Command. The majority of staff support work would have transitioned to TEXCOM with a small Headquarters cell remaining in the National Capital Region. This plan was overturned in FY96 but programmed decrements were still taken. The result was a severely understaffed Headquarters for OPTEC and for the Operational Evaluation Command.

In FY97 151 enlisted spaces and 72 civilians were reduced for OTPEC 2000. In FY97 OPTEC assumed the developmental evaluation mission. We received 151 spaces to accomplish the additional mission; however, we did not receive enough funding to support the mission or manpower.

In FY98 the last of the OPTEC 2000 reductions were taken. Seven enlisted and 15 civilian spaces were reduced. We also lost six officers, 124 enlisted and 14 civilian spaces for the Headquarters Redesign Decrements. The magnitude of this reduction forced us to inactivate the TEXCOM Experimentation Command, eliminating the only Army unit dedicated to force-on-force operational testing. In FY98 we were directed by HQDA to transfer three acquisition officer positions to support AAESA. We were assessed a 12 space civilian decrement for civilian affordability and we lost nine officer and 13 enlisted spaces for QDR. In the field grade Officer Restructuring Initiative (ORI) we reduced two COL positions to LTC, two LTC positions to MAJ, and 73 MAJ positions

to CPT. Field grade officers are important to the command to ensure all aspects of field operations are considered when designing tests. Officers must be knowledgeable in doctrine, tactics, training, and equipment in order to integrate systems into a realistic battlefield environment. The grade reductions have increased the number of systems per officer, stretching the officer too thin. We can also expect to see larger numbers of nonmajor systems with no "green suit" evaluator.

In FY99 the reductions associated with the developmental evaluation mission hit. We were reduced 76 spaces of the 151 we received in FY97. OPTEC realigned 20 spaces internally to offset the loss. HQDA provided 20 unfunded civilian spaces and OPTEC reprogrammed dollars to pay for them. We also lost another two officer and 19 enlisted spaces for QDR and were reduced five enlisted spaces for the MI Restructure Initiative. In the second round of field grade officer reductions (ORI) we reduced a COL position to LTC and 31 additional MAJ positions to CPT. We also implemented Change in NCO Structure (CINCOs) by reducing 11 E5s to E4s, 1 E6 to E4, 3 E7s to E4s, and 1 E8 to E4.

From FY90 through FY99 reductions to OPTEC's TDA have been 49% as shown below.

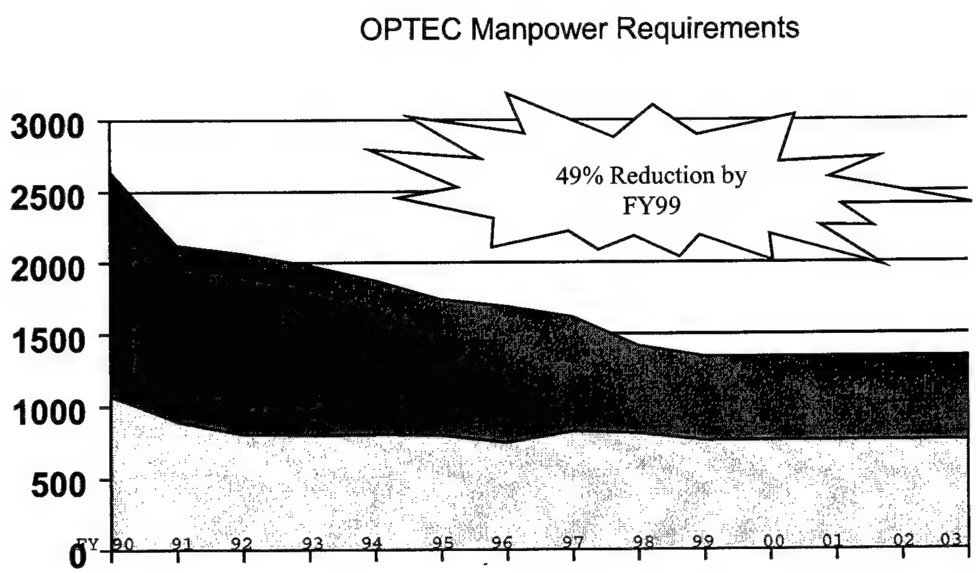

Figure 6.1 Personnel Reductions in Test Centers since 1990.

6.B – Analysis of the Cost Based Management Tool Data and Identification of FY96 laboratory and T&E Center Infrastructure Costs

Following the Army methodology described in section 1 of this report, cost data has been identified for each financial category, support taxonomy, and warfighting technology area and is shown in Table 6.B1 below.

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	23349	18586	79.60%	4763	20.40%	14.23%
3.2 – Civilian Labor	28427	22879	80.48%	5548	19.52%	16.57%
3.3 – Travel	5076	4110	80.97%	966	19.03%	2.89%
3.4 – Contractor Services*	45244	36881	81.52%	8363	18.48%	24.98%
3.5 – Other Gov't Services	18041	15624	86.60%	2417	13.40%	7.22%
3.6 – Minor Equip	7590	6016	79.26%	1574	20.74%	4.70%
3.7 – Common BOS	8879			8879		26.52%
3.8 – Increment BOS	727			727		2.17%
3.10 – Land Use	11			11		0.03%
3.12 – Leased Buildings	621	435	70.05%	186	29.95%	0.56%
3.14 – Leased Cap Equip	237	190	80.17%	47	19.83%	0.14%
Totals	138202	104721	75.8%	33481	24.2%	100.00%
Support Taxonomy						
Command Mgt./Admin				11257	33.62%	
Facilities Support				2573	7.68%	
Financial Mgt.				2178	6.51%	
Human Resources				1855	5.54%	
Contracts Admin.				2565	7.66%	
Supply Support				2642	7.89%	
C2 Data Systems				738	2.20%	
Military Support Act				56	0.17%	
Other Support				0	0.00%	
Common BOS				8879	26.52%	
Incremental BOS				727	2.17%	
Land Use				11	0.03%	
Total				33481	100.00%	
Warfighting Technology Area						
Air Systems		14060	13.43%	4495		
Electronic Combat		10509	10.04%	3360		
Armaments/Munitions		16427	15.69%	5252		
Space Systems		0	0.00%	0		
Land Systems		42288	40.38%	13520		
Sea Systems		0	0.00%	0		
C4I		21341	20.38%	6823		
Corporate Technology		0	0.00%	0		
Other Technical		96	0.09%	31		
Total		104721	100.0%	33481		

Table 6.B1 FY96 Technical and Infrastructure Support Costs. ($K)

From Table 6.B1, we can draw the following inferences:

- 68.3% of the infrastructure costs can be found in three of the CBMT metrics (Civilian Labor, Contractor Support and Common Base Operation Support). Contractor support costs can not be interpreted as strictly labor as there are other direct costs in this category.

- $104.3M was spent on direct technical (mission) work in FY96. 60.6% is assigned to two of the product technologies (Land Systems and C4I).

- $33.8M was spent on indirect mission support work. Two of the support taxonomies (Command Mgt/Admin and BASOPS) account for 60.6% of all support costs.

In addition, we also analyzed the cost category of Capital Expenses that captured the original and renovation costs of buildings and capital equipment. Those figures are shown in Table 6.B2 – Capital Expenses. They are not used in the determination of an infrastructure cost baseline to establish reduction requirements in support of Section 912(c), because they represent sunk costs that are not recoverable.

Table 6.B2 – Capital Expenses – Not used in Baseline Determination

Metric	$ Spent (Acquisition & Upkeep)
Gov't Owned Buildings.	35.9M
Gov't Owned Equipment	375.7M

6.C – As indicated in Section A, OPTEC has undergone numerous cost reduction initiatives and redesigns. Our military strength alone has been reduced 54.7% since FY92. OPTEC feels strongly that we are operating with the minimum staff required to complete its mission.

Based on the infrastructure costs identified in the CBMT, the OPTEC reduction goals should follow the following pattern.

Financial Category	FY96 Infrastructure Support Costs	FY01 Reduction Goal (K)	FY05 Reduction Goal (K)
3.1 – Mil Labor	4763	476	1191
3.2 – Civilian Labor	5548	555	1387
3.3 – Travel	966	97	242
3.4 – Contractor Services*	8363	836	2091
3.5 – Other Gov't Services	2417	242	604
3.6 – Minor Equip	1574	157	394
3.7 – Common BOS	8879	888	2220
3.8 – Increment BOS	727	73	182
3.10 – Land Use	11	1	3
3.12 – Leased Buildings	186	19	47
3.14 – Leased Cap Equip	47	5	12
Total	33481	**3348**	**8370**
Support Taxonomy			
Command Mgt./Admin	11257	1126	2814
Facilities Support	2573	257	643
Financial Mgt.	2178	218	545
Human Resources	1855	186	464
Contracts Admin.	2565	257	641
Supply Support	2642	264	661
C2 Data Systems	738	74	185
Military Support Act	56	6	14
Other Support	0	0	0
Common BOS	8879	888	2220
Incremental BOS	727	73	182
Land Use	11	1	3
Total	33481	**3348**	**8370**
Warfighting Technology Area			
Air Systems	4495	450	1124
Electronic Combat	3360	336	840
Armaments/Munitions	5252	525	1313
Space Systems	0	0	0
Land Systems	13520	1352	3380
Sea Systems	0	0	0
C4I	6823	682	1706
Corporate Technology	0	0	0
Other Technical	31	3	8
Total	33481	**3348**	**8370**

Table 6C.1 Infrastructure Cost Reduction Goals for FY01 and FY05 ($K)

Based on current OPTEC plans, however, these reduction goals are on hold pending consolidation of Army testing installations.

6.D – Cross-Service Infrastructure Cost Reduction Plan.

The results of the cross-service studies initiated by OSD indicate a lack of significant savings to be found in additional cross-service initiatives and no plans have been approved for implementation to date.

6.E – Conclusion

On 1 October 1999, OPTEC will be expanding as the TECOM mission, functions, resources, and personnel will transfer to Army Test & Evaluation Command (ATEC) in accordance with the Consolidation of Army Testing Alternative Option briefed on 16 June 98 and 6 October 98 to the VCSA. The transfer will include responsibility for all test ranges to include Aberdeen Test Center, Aberdeen Proving Ground, MD; Aviation Technical Test Center, Ft Rucker, AL; Dugway Proving Ground (DPG), UT; Redstone Technical Test Center, Redstone Arsenal, AL; White Sands Missile Range (WSMR), NM; and Yuma Proving Ground (YPG), AZ and the responsibility for installation management of YPG, DPG, and WSMR. This will complete the Army Science Board recommendation to consolidate T&E. The consolidation will posture Army T&E for the future and result in a more efficient and effective T&E by improving the test process and by having a single voice for Army T&E resources.

If we were to look at total T&E (OPTEC and TECOM) from FY90 to FY03, there is a total TDA reduction of 60%. The total Army reduction was only 38% during the same timeframe. The consolidation of OPTEC and TECOM does not cause additional personnel reductions or personnel relocations.

7. U.S. Army Research Institute for the Behavioral and Social Sciences (ARI)

7.A - Previous Infrastructure Reductions - Peak Year to FY 99

Since its peak year in FY 92, the organizational structure of the Army Research Institute changed significantly as a result of initiatives to consolidate and streamline Army Laboratories. In particular, the DMRD 936 - Vanguard and Army Lab 21 Studies - resulted in the reduction of 11 Civilian/4 Military authorizations and the transfer of 54 Civilian/3 Military authorizations supporting the MANPRINT Division to the Army Research Laboratory. These manpower and the concurrent funding transfers and cuts necessitated the development of functional efficiencies and infrastructure reductions, to include the restructuring of the supervisor to employee ratio. In addition, the two remaining divisions at ARI (Training Systems, and Manpower and Personnel Research Divisions) were consolidated, field research units were closed, and headquarters staff functions were reviewed and consolidated. As a result of the transfers and consolidations, ARI realized infrastructure reductions of 48 Civilian/12Military authorizations, $ 4,377K in direct funding and 24,000 square feet of office space in the years between FY 92 and the CBMT baseline year of FY 96.

As a result of Army Redesign initiatives, ARI was assessed additional manpower and funding reductions and was realigned as a directorate of PERSCOM effective 1 Oct 97. As a consequence of this reduction, additional infrastructure savings of 40 Civilian/2 Military authorizations and $2,849K were achieved between FY 96 and FY 99.

Figure 7.1 below shows the major organizational restructuring that has taken place in ARI between FY 92 and FY 99.

FY	Organizational Element	Change
93	MANPRINT Division	Transferred to ARL
93	Army Personnel Survey Office from PERSCOM to ARI	Transferred from PERSCOM
94	Fort Bliss Research Unit	Closed
94	Fort Gordon Research Unit	Closed
94	Strategic Leadership Technical Area	Disestablished
94	Manpower and Personnel Policy Research Technical Area	Disestablished
95	Unit-Collective Training Research Unit at Presidio of Monterey	Closed
95	Training Systems and Manpower and Personnel Research Divisions	Consolidated
95	Plans, Programs and Opns Office and Financial Mgmt Office	Consolidated
95	Occupational Analysis Office	Transferred from PERSCOM
95	Ft. Irwin, NTC, Research Element	Closed
97	Leader Development Research Unit, West Point, NY	Closed
97	London Research Office, UK	Closed
98	Plans, Programs and Budget, Mgmt Spt Office and S&T Information Ofc	Consolidated
99	Information Management Office	Transferred to ARI

Figure 7.1 ARI Restructuring Since the FY 92 Peak Year

7.B - Analysis of the Cost Based Management Tool Data and Identification of FY96 laboratory and T&E Center Infrastructure Costs

Following the Army methodology described in section 1 of this report, cost data has been identified for each financial category, support taxonomy, and warfighting technology area and is shown in Table 7.B1 below.

Financial Category	Total	Technical	Percent Technical	Support	Percent Support	Percentage of Infrastructure
3.1 – Mil Labor	847	204	24.09%	643	75.91%	8.06%
3.2 – Civilian Labor	13405	9524	71.05%	3881	28.95%	48.63%
3.3 – Travel	663	609	91.86%	54	8.14%	0.68%
3.4 – Contractor Services*	8484	8007	94.38%	477	5.62%	5.98%
3.5 – Other Gov't Services	1976	829	41.95%	1147	58.05%	14.37%
3.6 – Minor Equip	700	581	83.00%	119	17.00%	1.49%
3.7 – Common BOS	946			946		11.85%
3.8 – Increment BOS	546			546		6.84%
3.10 – Land Use	2			2		0.03%
3.12 – Leased Buildings	968	802	82.85%	166	17.15%	2.08%
3.14 – Leased Cap Equip	0	0		0		0.00%
Totals	28537	**20556**	72.0%	**7981**	28.0%	100.00%
Support Taxonomy						
Command Mgt./Admin				2718	34.06%	
Facilities Support				0	0.00%	
Financial Mgt.				410	5.14%	
Human Resources				85	1.07%	
Contracts Admin.				175	2.19%	
Supply Support				99	1.24%	
C2 Data Systems				1427	17.88%	
Military Support Act				0	0.00%	
Other Support				1573	19.71%	
Common BOS				946	11.85%	
Incremental BOS				546	6.84%	
Land Use				2	0.03%	
Total				7981	100.00%	
Warfighting Technology Area						
Air Systems		0	0.00%	0		
Electronic Combat		0	0.00%	0		
Armaments/Munitions		0	0.00%	0		
Space Systems		0	0.00%	0		
Land Systems		0	0.00%	0		
Sea Systems		0	0.00%	0		
C4I		0	0.00%	0		
Corporate Technology		17696	86.09%	6871		
Other Technical		2860	13.91%	1110		
Total		**20556**	100.0%	**7981**		

Table 7.B1 FY 96 Technical and Infrastructure Support Costs ($K)

As shown in Table 7.B1 above 57% of the ARI Infrastructure for FY 96 were labor costs (Civilian and Military) and 14% were for services provided by other government activities. Of course, it is in these financial categories that the bulk of the savings are achieved.

Capital expenses that reflect the value of buildings and capital equipment are shown in Table 7.B2. They are not used in the determination of the baseline since they reflect sunk costs that are not recoverable.

Metric	$ Spent (Acquisition & Upkeep)
Gov't Owned Buildings	3.0M
Gov't Owned Equipment	10.8M

Table 7.B2 - Capital Expenses - Not used in Baseline Determination

7.C - Infrastructure Cost Reductions Proposed by FY 01 and FY 05

As stated in Section 7 A, in FY 98 ARI already had achieved significant infrastructure reductions. The work force was cut from 245 Civilian/11 Military authorizations to 119 Civilian/6 Military authorizations. This reflects infrastructure savings in personnel of 40 Civilian/1 Military authorizations. By FY 99, infrastructure costs funded in direct accounts for civilian labor and benefits were reduced from $3,942K to $2,512K. Non-pay infrastructure costs in direct accounts were reduced from $2,507K to $1,094K. So, by FY99, infrastructure costs charged to ARIs direct funds were already reduced by 44%.

An analysis of where savings did or did not develop among the various data elements reflected the change in operations that the organization undertook to accommodate the reduced staffing and funding levels imposed by the Army Redesign initiatives. For instance, the large savings in Other Government Services reflects, in part, (1) the transfer of Information Management personnel from PERSCOM (Other Government Services) to ARIs manning structure (Civilian Labor); and (2) a move from main-frame hardware to a client-server networked system purchased through PERSCOM (Other Government Services) and now maintained internally with minor equipment and supply purchases. Some savings therefore create minor increases in other categories.

Table 7.C1 identifies where the savings are expected to accrue in FY01 and FY05 by financial category, support taxonomy and warfighting technology area. As ARIs reductions were assessed in FY 98, the savings in out-years are predicted based on the current operational structure of the organization.

Financial Category	FY 96 Infrastructure Support Costs	FY 01 Reduction Goal (M)	FY 05 Reduction Goal (M)
3.1 - Mil Labor	643	64	161
3.2 - Civilian Labor	3881	388	970
3.3 - Travel	54	5	14
3.4 - Contractor Services	477	48	119
3.5 - Other Gov't Services	1147	115	287
3.6 - Minor Equipment	119	12	30
3.7 - Common BOS	946	95	237
3.8 - Increment BOS	546	55	137
3.10 - Land Use	2	0	1
3.12 - Leased Buildings	0.166	17	42
3.14 - Leased Cap Equip	166	0	0
Total	7981	**798**	**1995**
Support Taxonomy			
Command Mgt./Admin	2718	272	680
Facilities Support	0	0	0
Financial Mgt.	410	41	103
Human Resources	85	9	21
Contracts Admin.	175	18	44
Supply Support	99	10	25
C2 Data Systems	1427	143	357
Military Support Act	0	0	0
Other Support	1573	157	393
Common BOS	946	95	237
Incremental BOS	546	55	137
Land Use	2	0	1
Total	7981	**798**	**1995**
Warfighting Technology Area			
Air Systems	0	0	0
Electronic Combat	0	0	0
Armaments/Munitions	0	0	0
Space Systems	0	0	0
Land Systems	0	0	0
Sea Systems	0	0	0
C4I	0	0	0
Corporate Technology	6871	687	1718
Other Technical	1110	111	278
Total	7981	**798**	**1995**

Table 7.C1 Infrastructure Support Cost Reduction Goals for FY 01 and FY 05 ($M)

Plans for the manpower and funding cuts taken in FY 98 included infrastructure reduction initiatives. Table 7.C2 identifies those initiatives by warfighting technology area showing the anticipated savings in FY01 and FY05.

Warfighting Technology Area	Infrastructure Cost Reduction Initiative	Planned * FY01 Reductions	Planned* FY05 Reductions
Corp Tech	Management Reductions	0.713	0.450
	Other Infrastructure Streamlining	0.521	0.433
	Information Management Reductions	0.817	0.586
	BOS Cost Reductions	0.459	0.383
	Total	**2.510**	**1.852**
Other Tech	Management Reductions	0.116	0.073
	Other Infrastructure Streamlining	0.085	0.071
	Information Management Reductions	0.133	0.095
	BOS Cost Reductions	0.075	0.062
	Total	**0.409**	**0.301**
	Grand Total	**2.919**	**2.153**

* Based on savings already achieved in FY 98.

Table 7.C2 Planned Infrastructure Cost Reductions by Warfighting Technology Areas ($M)

Infrastructure cost reductions for ARI are described in the tables in Section 7 C. Table 7.C3 is a summation of those initiatives.

		FY01	FY05
Total Infrastructure Reductions		$2.919	$2.153
	A76 Personnel Reductions		
	A76 Personnel Headcount		
	Non-A-76 Personnel Reductions	$0.87	$0.443
	Non-A-76 Personnel Headcount	40	40
	Other Reductions	$2.049	$1.71
	Amount NOT in POM		

Table 7.C3 Planned Personnel Reductions ($M)

7.D – Cross-Service Infrastructure Cost Reduction Plan

Not Applicable

7.E - Conclusion

From the ARI FY96 baseline, savings of 37% by FY01 and 27% by FY05 are projected. Efforts to reduce infrastructure, however, have been ongoing for some time. Between FY92 and FY96, reductions amounting to 47% of directly appropriated infrastructure dollars, 39% civilian/63% military infrastructure authorizations. Figure 7.3 shows the savings in direct funds and authorizations with the peak year as the baseline. All tables are in "then year" dollars, therefore reduction of savings in out-years reflects increased costs due to inflation.

Therefore, ARI has more than met the goal of a 10% reduction in FY01 and 25% in FY05, either when calculated from a baseline of its peak year (FY92) or from that of FY96.

Infrastructure Reductions resulting from Army Redesign Initiatives	FY 92 Baseline	FY 96 Savings	FY 01 Savings	FY 05 Savings
A 76 Personnel Reductions				
A 76 Personnel Headcount				
Non-A 76 Personnel Reductions	$4.782	$0.901	$1.778	$1.402
Non-A 76 Personnel Headcount	123	48	88	88
Other Reductions	$4.609	$3.476	$4.327	$4.077
Total Savings	$9.931	$4.377	$6.105	$5.479

Figure 7.3 Infrastructure Savings from FY 92 Baseline

Figures above reflect savings in direct dollars only as FY92 data for those metrics funded by other sources (Common and Incremental BOS, Cost of Leased Buildings, etc.) was not readily available.

NAVY IMPLEMENTATION PLAN

INTRODUCTION & BACKGROUND

CONTINUATION OF A HISTORICAL CONSOLIDATION EFFORT

The Department of Navy has followed a pattern of consolidation and reduction of RDT&E infrastructure since the Korean War. Major consolidations occurred in mid 1960 and in mid 1970. Subsequently, the Base Realignment and Closure Act of 1990 provided an additional mechanism to accomplish significant consolidations and to make major base closures while still maintaining the full-spectrum life cycle support required.

DON RDT&E FULL-SPECTRUM PHILOSOPHY

The DoN views RDT&E and In-Service Engineering as a continuum over the cradle-to-grave life cycle of warfighting systems. There has been a conscious effort to follow this philosophy in the Departments organizational decisions. The Department's acquisition establishments have been continually consolidated towards Centers of Excellence in specific warfare areas, which would encompass those full spectrum responsibilities. As a result of these historic consolidations, DoN has no separate T&E Centers as do the other services. The Navy RDT&E Centers are more similar to the Army's Research, Development and Engineering Centers but they have even broader responsibilities. It has been the Departments experience that this consolidation of responsibility and collocation of efforts, within warfare areas, allows for more efficient loading and use of facilities, more efficient management structures, and more efficient coordinated use of personnel. There is integration across the total span of threat tracking and projection, RDT&E, production support, In-Service Engineering and the solving of fleet problems. This organic capability and corporate memory, established from this policy, has had immeasurable value to the warfighter and the taxpayer.

WORKING CAPITAL FUNDING AND MRTFB FUNDING

The Department uses a Capital Working Fund Fiscal System to operate the RDT&E Centers in a manner very similar to the fiscal systems within private industry. Program Managers make a request for support efforts and provide funds for that effort. The RDT&E Centers manyear rates, that make up the charges to the Program Manager, include direct salaries, benefits and burdened overhead to fund the cost of running the base. They also include all management and administration operations. Therefore, the centers have a continual impetus to operate efficiently, to strive for low man year rates and high technical capability, in order to respond to Program Managers needs and budgets. The overhead costs, including base operations, are constantly monitored for areas of reduction. Within DoN, overhead savings relate directly to Program Savings, since most money comes from the programs. There is some institutional funding associated with the Major Range and Test Facility Base in four of

the DoN RDT&E Centers but these funds are only administered for distinct facilities and ranges. Most RDT&E facilities within a DoN Center do not come under the MRTFB and most RDT&E Centers do not presently have any MRTFB funding. DoN has approximately $270M MRTFB dollars out of a RDT&E Center business base of $10.5B. Of that business base, 73% of the funds are passed on to private industry for goods and services required to support acquisition of warfighting equipments.

IMPORTANT ROLE OF DON IN-HOUSE RDT&E CENTERS

The Navy experience and "lessons learned" through wars, cold wars, peace keeping deployments, short-lived skirmishes and intermittent periods of preparatory peace, show that the organic capability and corporate memory of some level of DoN internal RDT&E is critical to the warfighter and robustly complementary to the industrial complex. These DoN in-house RDT&E centers are critical to the combination of systems into "systems of systems." They are also necessary to translate battlefield needs and counter-threat considerations into acquisition requirements, help select the proper industrial firms to develop the warfighting systems and then to ascertain that the systems produced meets the requirements and will be viable upon warfighter use. Our philosophy maintains an in-house "smart buyer" with knowledge of both technology and warfighter needs.

WHAT DON ACCOMPLISHED IN BRAC

The Navy made significant use of the opportunity provided by the 1990 Base Realignment and Closure Act. DoN had a total of 178 BRAC actions. This included 135 closures and 43 major realignments. The up-front costs were $10.3 Billion dollars. However, $15.7 Billion dollars have been saved to date with additional out-year savings of $2.6 Billion dollars annually. Don completely closed 13 RDT&E sites, and closed 27 other RDT&E activities that were tenants at host sites. The BRAC efforts also allowed the Department, through consolidation, to purify and control missions across all of the centers. In addition, BRAC allowed the DoN to cross-service and collocate major efforts to, or with, other services. These included jet engine testing, air-crew systems testing, and a number of specialized research areas. Concurrent with BRAC actions, the number of technical personnel within the Department has been significantly reduced since 1991. The workforce has been decreased from that 1991 point by 37% at present and is projected to be 42% lower by 2003.

GENERATION OF DEPARTMENT OF NAVY INTERNAL PLAN

VISION 21

Section 277 of the FY1996 National Defense Authorization Act required the Department of Defense to submit a plan and legislative requirements for minimizing the number of laboratories and T&E centers within the Department. The plan included intra-service and inter-service efforts. The DoN internal strategy pre-decisional outline, which would have been an input to the overall DoD plan, identified additional sites that could potentially be closed, other consolidations, buildings to be razed, processes to be changed and efforts for cross-service considerations. This strategy outline was never formally completed nor approved. Work on the plan was halted when new Base Realignment and Closure authorization was not provided. However, the basic process and strategy were used as the foundation for efforts associated with Section 912 of the FY1998 National Defense Authorization Act.

SEC 912 PLAN

The provisions within Section 912 of the FY1998 National DefenseAuthorization Act required the Secretary of Defense to consider a plan for workload movement to primary sites under the provisions of existing law and determine what efforts could be further consolidated. The study approach also had two main thrusts: First, determine what could be accomplished within each service and Second, determine what additional Cross-Service activities were possible. The DoN used the previous Vision 21 internal pre-decisional strategy as a starting point for the Section 912 internal plan with the proviso that no planning for base closures could occur. Each major Systems Command submitted an individual draft plan. These plans were coordinated by an inter-command working group and then modulated by a Senior Naval Oversight Group, chaired by the Vice Chief of Naval Operations. The Assistant Secretary of Navy (Research, Development and Acquisition) and the Systems Command Commanders were among the members of the oversight group.

SECTION 2687

Section 2687 of title 10, United States Code, is the present law that governs movement of workload, realignments and closures of military activities. The law states that congress must be notified in the annual request for authorization of appropriation of any action that would:

-Close a military base that is authorized to employ more than 300 full-time permanent government civilian personnel.

-Realign an installation involving a reduction by more than 1000 civilian personnel or more than 50 percent in the number of civilian personnel authorized to be employed at the installation.

The law specifically defines realignment "as any action which both reduces and relocates functions and civilian personnel positions, but does not include a reduction in force resulting from workload adjustments, reduced personnel or funding levels, skill imbalances or other similar causes." The law defines military installation "as a base, camp, post, station, yard, center, homeport facility or other activity under the jurisdiction of the Department of Defense, including leased facilities." The DoN internal plan was constituted in accordance with the provision of Section 2687. Many of the initiatives within the plan consider re-engineering of processes within a center, the competitive outsourcing of efforts required by A-76 procedures, and other business practice changes. However, there are areas that are impacted by workload considerations due to reduced personnel and funding levels. Workload movements and changes in organizational structures were necessary to accommodate those personnel end-strength and funding level reductions and to more fully consolidate similar efforts as a result of those reductions..

DRIVERS AND STRATEGIES TO GUIDE DON CHANGES

To accommodate the overall end strength reductions and the general decline in budget levels, the DoN Oversight Group considered these factors in order to optimize workload and organizational changes in generating the final plan:

-The consolidation of all energetic work within DoN under one command to ensure proper coordination of efforts and to separate the Explosives Safety Board responsibilities from direct energetics activity in order to eliminate a perceived conflict of interest.

-Complete the consolidation of all weapons related work under one command as was outlined in the Secretary of Navy's memorandum directing earlier BRAC actions.

-In so far as practicable, consolidation of all weapons related efforts at specific locations, particularly when detachments, or secondary sites were involved.

-The minimization of outlying detachments, or secondary sites within an integral command structure.

-The general consolidation of similar types of workload to minimize overlap.

-The maximizing of fleet efforts in those areas associated with fleet operations.

-The review and re-engineering of all processes associated with maintaining the infrastructure.

-The review and re-engineering of all processes associated with acquisition.
-The outsourcing of appropriate industrial efforts.
-The definition and maintenance of core Navy and governmental responsibilities.

WORKLOAD IMPLICATIONS

A DoN internal plan outline was compiled from inputs from each of the DoN Systems Commands that have responsibility for the various warfare areas. The three major commands directly concerned with warfighting systems are: the Naval Air Systems Command, responsible for aircraft, air armaments and all DoN atmospheric missile systems; the Naval Sea Systems Command, responsible for submarines and surface ships and the weapons systems for those platforms (with the exception of missiles); and the Space and Warfare Systems Command, responsible for command, control, communications, computing and intelligence gathering systems. The Office of Naval Research, the Naval Supply command and the Naval Facilities Command also were involved with the plan preparation. The drivers and strategies outlined were used to generate inputs to the plan. The senior civilian from each of the commands formed a working group to coordinate initiatives across the Navy Department and to provide a draft plan to the Senior Naval Oversight Group for final determinations. Many of the initiatives were also collected from on-going studies within the Navy Department and within each of the individual commands to streamline, downsize and operate more efficiently since Section 912 is only one of a myriad number of on-going studies associated with the RDT&E infrastructure. The final Navy Plan was subsequently presented to the OSD 912 RDT&E Infrastructure Streamlining Study team leaders who, after receipt of some amplifying detailed data, then accepted and approved the plan for implementation and incorporation into the OSD final plan.

DON INTERNAL PLAN DETAILS

GENERAL DETAILS OF DON INTERNAL PLANS

The following chart summarizes the reduction efforts of the DoN RDT&E major claimants. Three of the major claimants are responsible for specific warfare areas. One claimant is responsible for science and technology coordination. The remaining claimant is responsible for facilities construction and maintenance. The chart outlines considerations for internal consolidations, workload movement, cross-service considerations, and business process re-engineering and other management efficiencies from on-going studies. All initiatives shown on the chart can be implemented within the existing authorities.

NAVY PLAN - AREAS OF CONSOLIDATION

	SPAWAR	NAVAIR	NAVSEA	ONR	NAVFAC
Migrate or **Curtail Work**		• Additional consolidation of weapons workload within NAWC • Energetics & Missle lead to NAVAIR	• Energetics & Missle lead to NAVAIR	• Radio Astronomy Fac, MD Point • Comm Research Fac, Waldorf, MD • Lt Gas Guns, DC	• Look for cost-share opportunities (low pvt sector RDT&E) • Concentrate on specialization
Consolidate Intra-Navy (By Area or Function)	• Consolidation Complete under BRACs	• Energetics & Missiles/Atmos Flight Weap to NAVAIR	• Energetics & Missiles/Atmos Flight Weap to NAVAIR • Boats & Craft		• Consolidation Complete under BRACs
Cross Service (Alt. Org Structures)	• Joint Integration & Interoperability Offices - CINC IPO's	• Engage Army on Rotorcraft RDT&E	• Engage Army & USAF on Boats & Craft • Review NV Electro Optics with Army		• All R&D redistrib via Project Reliance - only waterfront facilities R&D left
Competitive Sourcing (Non-Core Functions)	• Execcute Navy Business Plan • A-76 (as appropriate)	• Execute Navy Business Plan • A-76 (as approp.) - Base & other supt - T&E Range & Facility supt func	• Execute Navy Business Plan • A-76 (as approp.) • Ident & retain Core Equities	• Execute Navy Business Plan • A-76 appropriate overhead services	• Execute Navy Business Plan • Eliminate ISA accounting support • Implement Acquisition Reform
Cooperative Arrangements & Innovative Leasing		• Energetics, industry & government coop efforts & co-use facilities @ CL	• Outleasing • Dual-Use Facilities • "Re-Footprint" Facilities		• MOUs w/Research Foundations exploit collab w/Pvt Sector
Management Efficiencies (Process Change)	• BPR	• BPRs on T&E, Software Dev, Property Mgt • Integrated RDT&E Mgmt @ PAX &CL	• BPR at Sites • Align w/Systems Eng & HQ • Bldg demolition	• Consolidate 3 Research Divisions • Bldg demolition of 425K sq ft	• Cost Control Sys • Competence Mgmt • Perf Measures • Mgmt o/h efficiencies

<u>WHICH SPECIFIC ORGANIZATIONS WILL CHANGE</u>

The efforts explained in the chart summarizing the DoN Internal Plan and which will be explained further in the following paragraphs are either underway or are planned for implementation to accomplish the necessary savings levied on the DoN as reduction goals for Section 912. Many of the efforts are new. Some efforts are included here as part of the plan but were being pursued as on-going efforts to increase efficiencies and savings. Other efforts are recommendations from various studies whose conclusions had not been taken for action previously.

It has been concluded within DoN to move the claimancy of NSWC Indianhead, as an organization, from Naval Sea Systems Command to Naval Air Systems Command in order to consolidate all energetics efforts under one command and eliminate a possible conflict of interest for explosives safety responsibility.

It has also been concluded to transfer all atmospheric weapons related work and weapons personnel in NAVSEA, regardless of command and site, to NAVAIR. This completes an additional step in the DoN BRAC weapons consolidation initiative associated with the Warfare Center establishment and as directed by the Secretary of Navy. The personnel associated with this movement will become on-site detachments within The NAVAIR Team.

In concert with the above changes, other specific actions have been

identified to consolidate and collocate additional workload within NAWC in order to allow mothballing of facilities and change the responsibility emphasis at specific sites. In October 1998, the claimancy of the NAWCWPNS Pt. Mugu site was transferred from COMNAVAIRSYSCOM to CINCPACFLT to accommodate the siting of West Coast E-2C aircraft. NAWCWPNS Pt. Mugu is now a tenant at the newly designated operational base.

PERSONNEL SAVINGS

Initially there will be no specific personnel savings from the movement of organizations from one systems command to another. However, over time this movement will allow better control of assignments and the minimization of duplication. Significant personnel savings will probably be possible in the long term, but the specific amount is not known at this time.

Within the Naval Air Warfare Center, it is estimated that approximately 900 positions can be eliminated by additional consolidations.

The majority of the savings proposed by core equities studies, business process re-engineering and outsourcing will be from support personnel reductions. It is estimated that another 2600 positions may be eliminated from these efficiency efforts.

FACILITIES AND BUILDINGS

There has been a continuous effort to vacate and excess older buildings and facilities within DoN. The BRAC process was a significant tool in accomplishing this. A significant number of additional buildings and facilities have been identified for mothballing or demolition. Some of these are illuminated in the DoN internal plan but others are not. Many have recently been razed, vacated or excessed but others must wait for authorization and funding. Much of this effort is associated with normal, on-going, good business practices. At one RDT&E site over 1,000,000 square feet has already been vacated, declared excessed and razed with an additional 400,00 square feet identified and planned for demolition.

The DoN internal plan mentions the buildings for razing at the Naval Research Laboratory, which amounts to 425,000 square feet of footprint. Over 20 old buildings will be destroyed and replaced with a single, smaller, energy efficient building that will also be more usable and synergistic for the personnel. Similar efforts to those at NRL are being pursued at the other RDT&E sites but they were not specifically outlined in the plan

BUSINESS PRACTICES AND PROCESSES RE-ENGINEERING

Many of the on-going studies are associated with Business Process Re-engineering. These studies are initiated by inputs from a wide variety of sources from the Presidents Re-Invention of Government to OMB A-76 thrusts. A number of the efforts are associated with internal actions to accommodate budget reductions and saving wedge elimination. Coordination teams have been and will continue to be established to interchange lessons learned across the claimants and to share re-engineering initiatives that have been most successful.

The efforts involve competitive sourcing, cooperative arrangements with

industry, information technology investments, best business practice adaptations, regionalization of like functions, streamlining and eliminating support functions and other significant changes in the historical way of doing business. Each command and major claimant is reassessing oversight structure and management needs.

Acquisition process changes will optimize the dollars spent in the private sector. The re-engineering will significantly reduce the cost of government oversight (system assessment, guidance and integration) by increasing insight into programs up front and shorten the cycle time to deliver modifications and upgrades to the fleet. The re-engineering will reduce the cost and cycle time for direct work and reduce investment in infrastructure and facilities. Best business practices will be utilized in the areas of financial management, information technology and asset management. Activity Based Costing analysis is being pursued to highlight areas of possible change. Standard Procurement Systems are being pursued to minimize workload.

Competitive sourcing activities in accordance with A-76 procedures are being pursued by all claimants. However, since most of the present RDT&E site competitions are being won by the government, there is concern that the attendant savings may be smaller than anticipated. It appears that because of the continued long draw down in personnel at these RDT&E centers, the activities are already close to the most efficient organization (MEO) level and major additional changes may not be practical.

The DoN has an overall Department initiative, Enterprise Resource Planning, which is an adaptation of a new, but widely used, industry system to integrate all business practices in order to optimize functions across the entire enterprise. This includes order management, management reporting, financial, procurement, human resources, facility maintenance, inventory and operations. The system will provide consistent and reliable information for timely decision-making and performance measurement. The system will use IT-21 architecture, comply with Federal Financial Standards, will have single data entry at the source, will have end-to-end connectivity and will be a paperless process. An organization is in place to ensure all lower level initiatives support the ERP system.

Each of the major claimants has initiatives that support the Section 912 Internal Plan. These will also be integrated into the Departments overall ERP process.

DoN INTERNAL PLAN SAVINGS IDENTIFIED FOR 2001 AND 2005

The following chart outlines the estimated savings associated with the total DoN internal plan. These estimates are considered to be conservative and are not all inclusive. They are, however, close to the goals proposed for Section 912 savings from the DoN RDT&E infrastructure. Those goals, 10% in FY01 and 25% in FY05 of support costs, were based on establishing an accurate baseline of FY96 infrastructure support costs for the full spectrum continuum that included threat tracking and projection, RDT&E, production support, in-service engineering and the solving of emergent operational problems. Establishment of the FY96 baseline assumed three things across the three services and Defense Agencies: (1) that similar functions would have their costs collected based on type of work performed and not necessarily on the title of the facility or

functional organization, (2) that costs, per guidance issued in various and multiple formats and forums, could be allocated accurately into "bins" of both a product and a life-cycle taxonomy despite varying funding methods, different budgeting and accounting systems and disparate business practices and (3) that FY96 records would be complete, accurate and available. A cursory glance at the results of the data call indicates that these assumptions were not valid. Similar universes of functional work appear not to have been collected, "binning" methodologies and definitions of cost across different budgeting and accounting systems appear to have yielded ambiguous results and FY96 data was either not available or was incomplete for key data elements. As a result, the current baseline is somewhere between marginally and reasonably accurate. The savings estimated in the Navy internal plan approximate the given goals and are conservative in nature. All savings were already in the Navy POM either in the form of budget authority decreases or as funds available to recoup projected savings that have not materialized from the POM planning process.

A total of at least $388Million dollars annual savings have been estimated from the plan. The $36 M savings associated with workload movement within NAVAIR is additive to the total estimated savings of $352 M at the bottom of the chart. The additional movement of weapons workload across the two major commands and efforts worked out in additional cross-service activities will increase the savings by some amount that is yet unknown.

NWCF SAVINGS PLAN ESTIMATES

FY96$

Area of Consideration		Expected Savings FY01	FY05
Migrate or Curtail Work		TBD	$36.0 M* *Not Include in Total
Consolidate Intra-Navy (By Area or Function)		TBD	TBD
Cross Service (Alt. Org Structures)		$.15M	$1.8M
Competitive Sourcing (Non-Core Functions)		$40.4M	$72.6M
Cooperative Arrangements & Innovative Leasing		$.54M	$1.4M
Management Efficiencies (Process Change)		$123.7M	$277.8M
Total Estimated Savings (w/o supportive environment initiatives)		$165M	$352M

The cross-service savings are presently small. However, there is significant cost avoidance associated with reliance activities and the various initiatives of consolidation and collocation implemented under BRAC actions. The Navy has been the leader among the services in both dependence on another service and the collocation of similar efforts. Notable has been the closing of the Trenton RDT&E Center and the dependence on the U.S. Air Forcefor all jet engine testing. Crew systems testing, clothing R&D, land systems, training systems and medical research are among other areas of dependency or collocation. In addition, some of the tactical aircraft and air-launched weapons programs are now joint which may help to minimize overlaps and duplications. There are more high level Tri-Service Coordination groups being established to provide integration and to control unnecessary duplications. There are still areas that will be pursued to provide closer coordination across the services. However, the services must not be impeded in their Title 10 responsibilities or have their service core competencies adversely affected. The savings produced by additional cross-service efforts are not included in the Navy's internal plan.

SCHEDULE OF ACTIONS

The DoN Internal Plan implementation will start immediately. In fact, some of the initiatives are already being executed as a part of other on-going efficiency efforts tied to meeting projected but not realized savings wedges in the current POM. Organizational changes are being initiated and workload movements will occur as soon as practicable, but in concert with program requirements and personnel assignments. It will take some time to fully implement the plan. The implementation could be accelerated and additional significant associated actions could be taken if BRAC authority was granted.

CONCLUSIONS AND SUMMARY

The Don Internal Plan outlines general and specific efforts that will allow the Department to realize significant savings in infrastructure costs. Many of the efforts are inter-twined with ongoing efficiency initiatives. Savings are anticipated above those delineated in this plan and the separation of those savings just attendant to Section 912 will be difficult if not impossible as time progresses.

It is not anticipated that many civil servant reductions will be offset by contractor personnel from these initiatives because the focus is on process changes within the infrastructure. The exception would be in the competitive outsourcing area where industry personnel could replace civil servants if industry wins the competition. The plan only includes small net savings in those instances.

Most of the savings are from the infrastructure and support areas and not from direct technical program efforts. Much of the savings are related to support personnel. However, in some instances, because of consolidation opportunities, some personnel previously on direct programs will be let go and be replaced by fewer direct personnel at other locations. Specific programs will be prioritized and the higher priority programs will be executed first under the end-strength personnel limits.

There will be program savings as a result of the DoN internal plan. The costs to the programs will be less because man year rates at the RDT&E Centers will be lower due to infrastructure / overhead savings. Because of the Navy Capital Working Fund, the majority of overhead and infrastructure dollars comes directly from program funding. Therefore, when infrastructure is reduced there are savings to the programs.

Savings and cost avoidance from additional cross-service initiatives are possible, but not considered in the Navy's Internal Plan.

Additional rounds of Base Closure and Realignment would be extremely beneficial to the Navy Department in order to complete the necessary infrastructure reductions.

Reducing RDT&E Infrastructure Costs In Accordance With FY98 National Defense Authorization Act, Section 912c

United States Air Force Plan

March 1999

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EXECUTIVE SUMMARY

Several studies within the past five years suggest that there is unwarranted and unnecessary duplication of effort among the Services' Research, Development, Test and Evaluation (RDT&E) infrastructure and that the Services have not adequately reduced it to align with force structure plans. Therefore, streamlining the RDT&E infrastructure of the Department of Defense (DoD) was a recurring theme present in the BRAC '95 study, Congressionally mandated Vision 21 study, and most recently Section 912c of the National Defense Authorization Act (NDAA).

Over the past 20 years, the Air Force took steps to reduce its RDT&E infrastructure costs and to operate as efficiently as possible. We closed and/or consolidated 7 major test facilities and mothballed over 50 additional test assets at our 3 remaining test centers. We consolidated our Science and Technology activities under one laboratory organization, Air Force Research Laboratory. We merged two major commands within the Air Force to create Air Force Materiel Command (AFMC), responsible for both acquiring and sustaining our weapon systems. We further reorganized AFMC into business areas and will recognize a 47% manpower reduction and a $5B cost reduction from FY89 through FY05. We are actively working partnerships with industry in such areas as space lift, satellite control, and joint infrastructure planning. In addition, we established Tri-Service Reliances in every major product/ mission area (17 in all). As a result of Section 912c of the FY98 NDAA, the Under Secretary of Defense (Acquisition and Technology) was tasked to develop an implementation plan to restructure RDT&E infrastructure. USD(A&T) stated the primary goal was to reduce RDT&E infrastructure costs by at least 10% by FY01 and 25% by FY05 measured against a FY96 baseline.

This document provides the Air Force's internal plan for continuing to shape the Air Force RDT&E infrastructure and support OSD in meeting its infrastructure cost reduction objective. In developing this plan, the Air Force focused on the core RDT&E competencies necessary to develop, acquire, test, and provide in-service support for the weapon systems needed to meet Air Force mission requirements. This strategy allowed the Air Force to protect core Air Force technical requirements and identify those that could be either divested or relied upon from another Service, Agency, or commercial provider. As a result, the Air Force has identified and committed to infrastructure cost savings of approximately $362M by FY05.

In addition to in-Service reductions, the OSD staff established joint cross-service sector panels with Service General Officers to identify consolidation opportunities. These panels concluded that additional joint service consolidation opportunities exist primarily at the facility (not site) level and that joint or rotating commands provide no additional value. The Air Force and other Services will expand the role of joint coordinating bodies such as the Board of Directors (BoD) and Joint Aeronautical Commanders Group (JACG) to review cross-Service RDT&E infrastructure investments. The Air Force will move out aggressively to enhance joint Service infrastructure investment planning and facility utilization to provide best value from its RDT&E infrastructure to the DoD and the taxpayers.

The $362M infrastructure cost savings identified in this plan and the cross-Service consolidation opportunities identified by the cross-Service sector panels comply with the 25% OSD objective and ensures the Services will retain core RDT&E competencies for those areas which are central to accomplishing their missions in support of the national military strategy.

BACKGROUND

Over the past 20 years, the Air Force recognized the need for and methodically took steps to reduce its RDT&E infrastructure costs and to operate as efficiently as possible. We closed and/or consolidated 7 major test facilities and mothballed over 50 additional test assets at our 3 remaining test centers. We consolidated our Science and Technology activities under one laboratory organization, Air Force Research Laboratory. We merged two major commands within the Air Force to create Air Force Materiel Command (AFMC), responsible for both acquiring and sustaining our weapon systems. We further reorganized AFMC into business areas and will recognize a 47% manpower reduction and a $5B cost reduction from FY89 through FY05. These changes taken together virtually eliminate the excess capacity identified in the BRAC 95 studies. In those studies, demonstrated peak capacity (from the late 1980's) was the baseline. The overall workload and output of the RDT&E activities has not decreased appreciably since those peak years, but the manpower is dramatically lower highlighting the tremendous increases in overall efficiency and the elimination of that excess capacity. We are actively working partnerships with industry in such areas as space lift, satellite control, and joint infrastructure planning. In addition, we established Tri-Service Reliances in every major product/ mission area (17 in all), these reliance teams help reduce the duplication of effort between Services. The implementation of the T&E executive agent structure formalizes lines of communication and oversight between all Services on RDT&E issue from the field commanders all the way to the Vice-Chiefs of Staff. This process ensures increased cooperation between Services in the future.

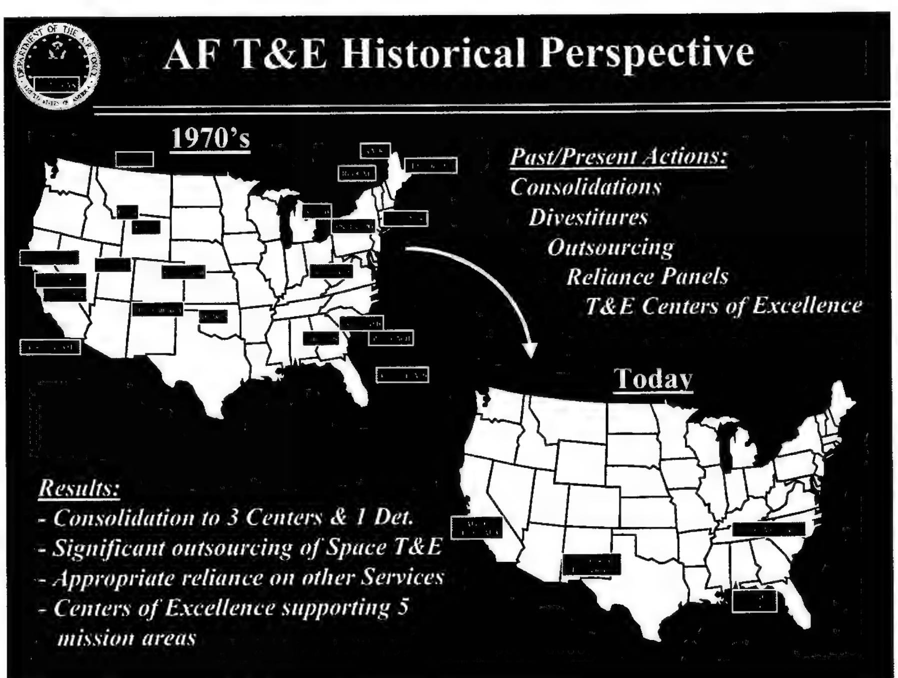

Exhibit 1

AIR FORCE RESEARCH LABORATORY

BEFORE	ORGANIZATION ELEMENT	AFTER
4	LABS	1
22	DIRECTORATES	9
115	DIVISIONS	50
351	BRANCHES	192
5	PLANNING STAFFS	1

AFRL is more efficient and more focused

Exhibit 2

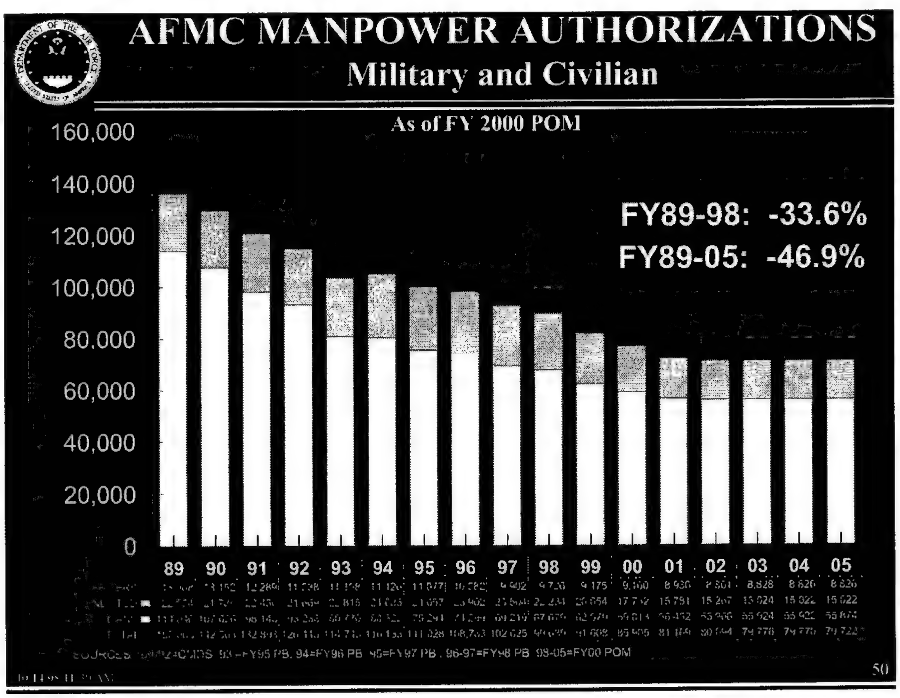

Exhibit 3

SCHEDULE

In July 1998, the Air Force began planning to comply with the FY98 National Defense Authorization Act (NDAA) Section 912c legislation, prepare the Air Force to accomplish the OSD proposed studies, and prepare a corporate Air Force RDT&E infrastructure strategy.

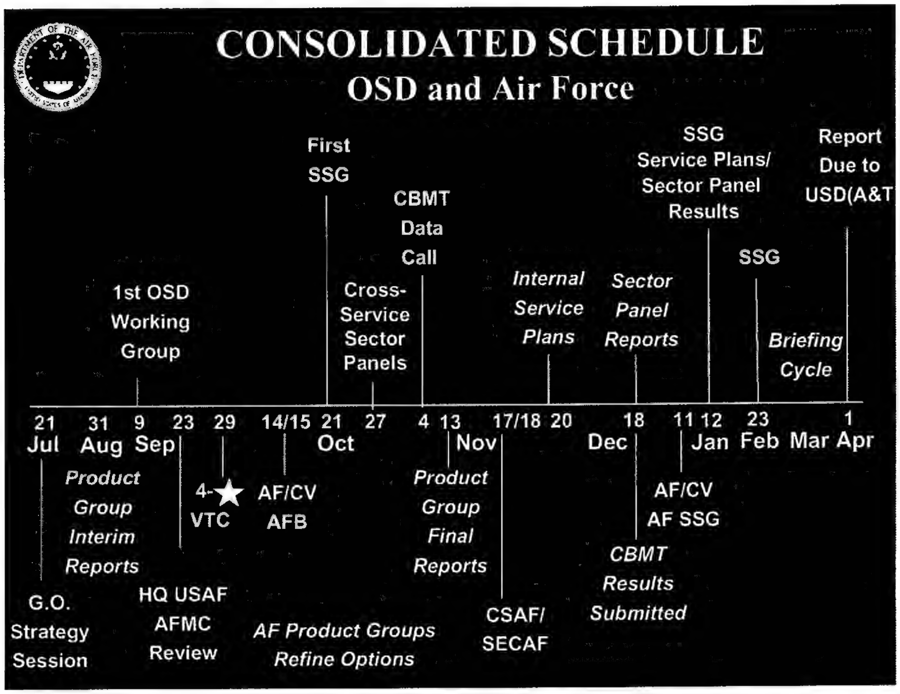

Exhibit 4

In a 17 Jun 98 memorandum, SAF/AQX and AF/TE asked AFMC to sponsor a general officers' meeting to discuss "out of the box" options and develop a well thought out overarching strategy for the Air Force. The Air Force position was developed in accordance with the four major product areas (market sectors in the commercial environment) that support the core competencies of the Air Force--Aeronautical, Air Armament, Space, and Command/Control (C^2I). The result was the formation of four Product Sector Working Groups co-chaired at the senior level by a representative warfighter/user and a senior AFMC product center representative. This integrated all lab, product, test, and logistics RDT&E activities for each product area across the infrastructure spectrum. The product areas and level-one taxonomy for each area included:

- Aeronautical (Airborne Directed Energy, Fighter, Bomber, Recce Surveillance, Rotary Aircraft, SOF Aircraft, Spaceplane, Transport/Tanker, Trainer Aircraft, UAV)
- Space (Spacecraft, Launch Vehicles, Space Ground Segments, ICBMs)
- Air Armaments (Conventional, Directed Energy, Nuclear)
- C^2I (Global Awareness, Global Grid, Ops Centers, Integration)

The Air Force strategy for the RDT&E Infrastructure Study was briefed to MAJCOM commanders during a 4-Star VTC on 29 Sep 98, and received strong endorsement by the affected operational commands (ACC, AMC, AFSPC, and AETC). The Air Force position was initially briefed to the Air Force Vice Chief of Staff on 14 Oct 98 and presented to the Air Force Board on 15 Oct 98. The final formulated strategy was approved by the Air Force Vice Chief of Staff

and the Acting Secretary of the Air Force on 17 Nov 98 and by the Air Force Chief of Staff on 18 Nov 98.

TASKING

The FY98 Defense National Authorization Act, Section 912 directed the Secretary of Defense to review acquisition activities and the personnel required to carry out acquisition functions. In more detail the law required DoD to:

Section A: Reduce Acquisition Workforce (25,000 with potential to waiver)
Section B: Report on Workforce Positions previously eliminated
Section C: Conduct a study and submit plan to streamline DoD acquisition
Section D: Review Acquisition Organizations/Functions, including:
- Cross-service, cross-functional arrangements
- Overlap, duplication, and redundancy
- Opportunities to further streamline acquisition process
- Alternative consolidation options for acquisition organizations
- Alternative acquisition infrastructure options
- Alternative organizational arrangements that capitalize on core acquisition competencies among military services/defense agencies

To implement Section 912c (as described in Section D), the Under Secretary of Defense (Acquisition and Technology) signed a charter for an OSD Senior Steering Group (SSG) to develop an implementation plan to streamline science and technology, engineering, and test and evaluation infrastructure. The SSG was chaired by USD (A&T), and includes the Service Vice Chiefs, Service Acquisition Executives, PD(A&T), DDR&E, DOT&E, JCS(DFSR&A), DTSE&E, and was supported by a working group for Labs, Engineering Centers, and Test and Evaluation Centers.

There were actually three parallel efforts under the Section 912 effort that fed into the OSD Senior Steering Group. First, OSD tasked the services to develop internal service options to preserve or enhance program content while reducing infrastructure cost, ultimately "supported" by data derived from a Cost-Based Management Tool (CBMT). Second, in a 7 Oct 98 memorandum, USD(A&T) directed Inter-Service Product Sector Panels to develop cross-service plans (using a strawman option set derived from previous studies) that aggressively break "rice bowls" in pursuing RDT&E infrastructure cross-utilization initiatives. Like the Big 10/Vision 21 studies, these initiatives were to be negotiated between services at the field G.O. level. Finally, the Defense Science Board Task Force provided recommendations on Integrated Test and Evaluation and Non-DoD Capabilities.

Specific objectives for the SSG in developing the plan were
- Establish RDT&E infrastructure for the 21st Century
- Reduce RDT&E infrastructure cost (FY96 baseline) by at least 10% by FY01 and at least 25% by FY05 as measured by the Cost Based Management Tool (CBMT)
- Implement a Cost-Based Management Information System that "allows ongoing tracking of the true costs of laboratory, engineering center, and test and evaluation center operations"

To support the study, OSD tasked the services to provide infrastructure data to populate the CBMT. This data tool portrayed Total Cost (<u>not</u> Cost per Unit of Output) and separated RDT&E

cost into categories: Direct Work, BOS, and Infrastructure Costs (People/Facilities). Language in the FY99 NDAA specifically prohibited DoD from undertaking any action which supports or collects data for BRAC purposes, and the Under Secretary of Defense (Acquisition and Technology) indicated the study was not pursuing BRAC authority. Data collected in this management tool was not intended for use in any BRAC-type cost comparison between services, facilities, and organizations. Its sole purpose was to establish the FY96 baseline for measurement of the future cost reductions.

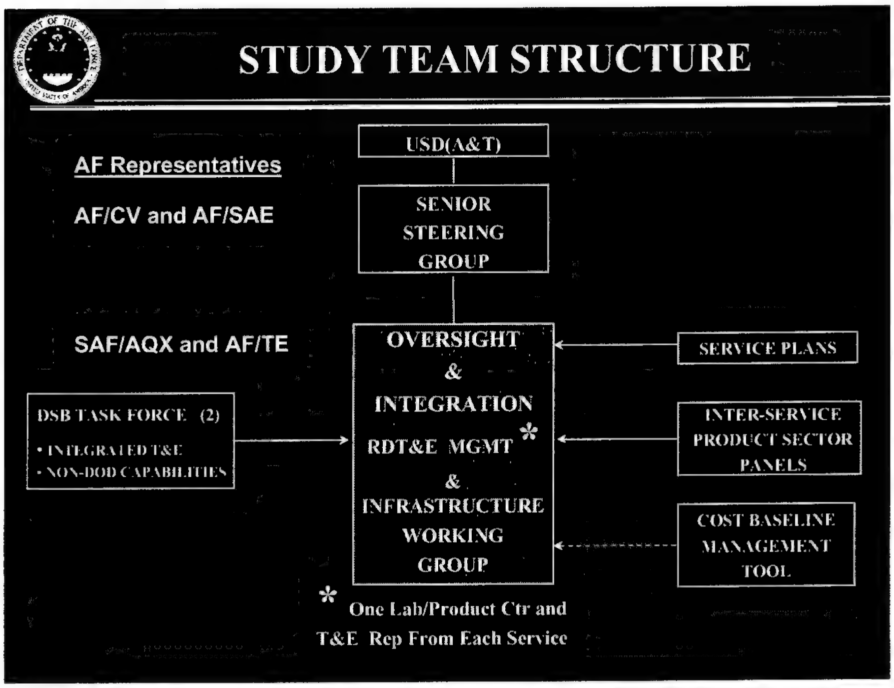

Exhibit 5

ASSUMPTIONS/CONSTRAINTS

A fundamental assumption made by each of the services at the outset of the study was that they would retain only the RDT&E organizational structure needed to preserve core competencies for weapon systems to meet their mission requirements, including those necessary to guide industry or be a "smart buyer." This may lead to some minor, but not unwarranted, redundancies, but was recognized as necessary to allow the services to wisely manage their Total Obligation Authority (TOA) . The ultimate result of this assumption, however, is that the assessment is drawn to the facility level and away from a roles and missions discussion.

The Air Force and the other Services recognized that each would have to organically maintain RDT&E infrastructure critical to its core competencies. However, this first assumption did not preclude organizations from one service being located at other service/agency locations. The Air Force will entertain proposals to lead multi-Service commands, partnerships with industry, and cooperative investment opportunities to the extent they support US best interest. These

organizational/mission realignments must be "Best Value," to the warfighter, the taxpayer, and the Air Force.

AIR FORCE STRATEGY
Assumptions/Constraints

- No BRAC authority or pre-BRAC positioning
- Previous studies provide baseline
  - BRAC 95 - Joint Cross Service Working Groups
  - Vision 21 / "Big 10"
  - T&E Board of Directors (BoD)
- Services retain RDT&E TOA
  - Necessary to guide industry or be a smart buyer
  - Does not preclude full cost reimbursement or AF organizations being located at other service/agency locations
- Best Value is basis for AF RDT&E infrastructure decisions
  - A good business case all that is needed -- i.e., requires no "quid pro quo"
  - Cost-based management tool data not available and not useful for value-based decisions (cannot measure cost per unit of output)

Exhibit 6

To preserve the integrity of the process, a fundamental ground rule concerning funding responsibility was that there be no programmatic transfer of TOA between services during budget formulation. There was, however, a realization that each service/agency must commit to fully burdened cost recovery for services provided for collocated activities. There developed, then, four categories of cost sharing:

- The first is self-reliance, wherein each Service splits related activities between locations and is responsible for resourcing the mission they are responsible for
- The second is co-location, where an activity is hosted by another service and pays its fair share of the infrastructure "rent." (co-location issues are the most numerous)
- The third is when a service is designated as lead service for an activity and fully POMs for the activity (TOA is transferred between services in this case)
- The fourth category is a joint service activity, where funding is provided through a joint program element

The Air Force, as were the other Services, was concerned about the potential reallocation of modernization funds. The Air Force did not agree to any form of consolidation of Air Force funds in an OSD program element and did not support putting RDT&E into an OSD working capital fund. A working capital fund does not work for areas, like T&E, without high, predictable throughput and provides no elasticity in acquisition customer's accounts to allow other than modest cost increases/decreases.

The Air Force recognized the need to establish a baseline to track cost reductions. The Cost-Based Management Tool was useful to track Service input costs against the 10% and 25% goals established by OSD, although existing accounting systems, both at the OSD and Service-level,

already provided much of this information. However, the Air Force also recognized that the Cost-Based Management Tool, as its title stated, was a cost of input-driven tool. Without capacity or quality measures, the CBMT could not evaluate best value and was thus unsuited for either intra- or inter-service comparisons.

OVERARCHING STRATEGY

The Air Force developed a strategy that protected core Air Force technical competencies and responded to the Section 912 tasking. The result was a product-focused strategy developed by the Air Force RDT&E community with support from the warfighter.

Air Force strategy retained RDT&E Infrastructure for the four major classes of Air Force weapon systems (Aeronautical, Space & Missile, C2I, Air Armament) when the Air Force is the principal user, has the preeminent infrastructure, and there is little or no commercial market outside DoD. The Air Force will rely more heavily on industry when commercial products meet or exceed AF requirements and business based opportunities exist for partnering/sharing cost. The Air Force will pursue Joint Service Collocation when other Services are willing to work at Air Force locations and the result is reduced Total Cost to the Air Force, and consolidation at the facility level to non-Air Force locations that reduce Air Force Total Cost.

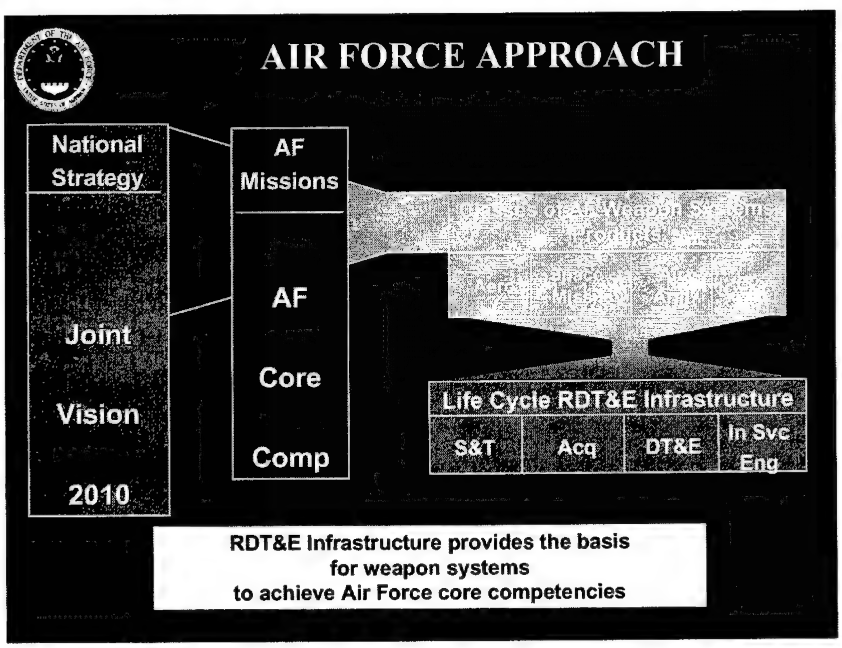

Exhibit 7

This strategy developed assured Air Force readiness for the future and full spectrum dominance of future conflict. Additionally, all Air Force core competencies are met and the Service is assured availability in critical technology areas. The strategy supports four major Air Force classes of weapon systems "product lines" -- Air, Space, Air Armament, C2I, -- while pursuing an investment strategy that capitalizes on what is already joint/co-located. The Air Force is committed to sizing the remaining RDT&E infrastructure (primarily to meet AF needs) in accordance with appropriate and adequate capacity, technical capability, leveraging business

areas and opportunities. The ultimate pursuit is a business case analysis that determines not only best value and best cost for the Air Force's RDT&E infrastructure, but the best value and best cost for total Air Force acquisition and sustainment infrastructure.

In the process of building the Air Force strategy, several overarching principles were highlighted. Best value includes the quality of the product/output, the efficiency of the process, and the cost per unit output, which were <u>not necessarily reflected in the total cost</u> (a concern associated with using the CBMT data.). For the Air Force, the ultimate driver was the impact/cost to the warfighter/user (as opposed to T&E impact). Any changes to the infrastructure process could not impact readiness or the Air Force capability to field and support an expeditionary Air Force (eAF).

Additionally, the primary reason the Air Force pursued this study from a product area/market sector focus was that these areas are the basis upon which the future of the Air Force absolutely depends. These four Air Force dominated product areas are markets the Air Force cannot walk away from without ceasing to exist. This study clearly showed that there are opportunities to save cost if other Services and agencies want to take advantage of the core capabilities the Air Force <u>must</u> continue to pursue and maintain. The Air Force will retain the RDT&E capability necessary to sustain its core functions.

APPROACH

The Air Force approach was to identify and develop a "best value" position for established Air Force strategic interests, which became the basis for all Air Force studies and senior-level discussion with the other Services and the OSD Section 912 study group. Using an initial methodology that employed the Work Breakdown Structure (WBS)/Taxonomy developed during the Vision 21 Study, the four product working groups were originally tasked to:

- Define why the Air Force needs "organic" technical competency and supporting RDT&E infrastructure
- Determine what the appropriate amount of organic infrastructure is to facilitate/sustain competency for the four major product lines
- Define what organic technical core competencies are required for each product line
- Identify what technical capabilities have cross service/streamlining potential
- Identify what infrastructure exists and where it is located
- Identify how much it costs now / could cost the Air Force in the future

Exhibit 8

To pursue its approach, the Air Force developed a decision matrix for the four product groups to use as they reviewed the RDT&E infrastructure for Air Force products/programs.

CATEGORY A: THE AIR FORCE IS THE PROVIDER OF CHOICE
This class of weapon systems/subsystems is central to the Air Force core competency. The Air Force is (and is expected to continue to be or become) the principal DoD/national user. This category includes joint activity up to and including the Air Force acting as lead Service or joint Service host. The risk is too high to rely on other providers because:

- The RDT&E infrastructure of other Services/agencies is less capable than Air Force infrastructure; or
- There is little or no commercial market outside of DoD/other government agencies; or
- The activity is not core to commercial providers (limited commitment to internal funds for IR&D); or
- The "track record" (cost/schedule/performance) or solvency of commercial providers is questionable

CATEGORY B: OTHER SERVICE/AGENCY IS PROVIDER OF CHOICE
This class of weapon systems/subsystems is central to the AF core competency. The Air Force/other Service/agencies are principal national users and AF is not anticipated to become the dominant user. In this category, technology is evolving and is not anticipated to have significant commercial value. There is joint activity up to and including services purchased from another military department or government agency. The risk to rely on other government providers is acceptable because:

- The RDT&E infrastructure of other services/agencies is superior or comparable to AF capabilities; or

- There is little or no commercial market outside of DoD; or
- The activity is not core to commercial providers (limited commitment to internal funds for IR&D); or
- The "track record" (cost/schedule/performance) or solvency of commercial providers is questionable

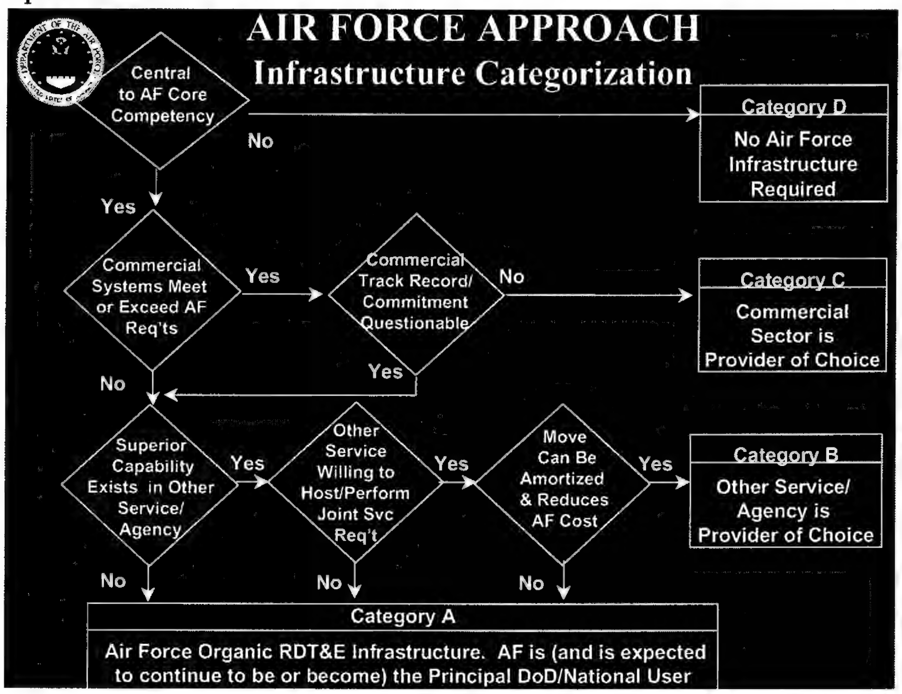

Exhibit 9

CATEGORY C: COMMERCIAL SECTOR IS PROVIDER OF CHOICE
This class of weapon systems/subsystems is central to the AF core competency. The Air Force and other service/agencies are not, and are not anticipated to become, the principal national users. Technology in this product area is mature or moving rapidly in the commercial sector. The risk to rely on commercial providers is acceptable because:

- The RDT&E infrastructure of industry is superior to government capabilities; or
- The performance of commercial systems meets or exceeds DoD requirements; or
- The activity is core to commercial providers (commitment to internal funds for R&D); or
- The "track record" (cost/schedule/performance) or solvency of commercial providers is acceptable with adequate competitive sources

CATEGORY D: NO INFRASTRUCTURE REQUIREMENT
This class of weapon systems/subsystems is <u>not</u> central to the Air Force core competency. There is no continuing or anticipated user requirement. The risk of not having Air Force RDT&E infrastructure is acceptable.

COMPETENCY AND FACILITY REVIEW

Reductions take the form of money, people, and facilities. Given the stated assumptions on TOA transfer and fully burdened cost recovery, the Air Force approach further addressed the primary funding cost (and potential savings) drivers -- people and facilities.

Exhibit 10

The Air Force recognized the criticality for keeping in-depth technical expertise in its core competencies. Stated directly, the Air Force acknowledged the need to retain adequate subject matter expertise across product areas in which it has significant interest. This did not imply that the government necessarily retains the ability to physically build every technology system, but the Air Force and other services need sufficient evaluation expertise to fully understand new technologies/systems. This implied that critical technicians and facility operators should be retained as required during the disposition of capabilities/facilities.

Regarding facilities, the Air Force identified a need to reduce where possible and divest facilities when they are no longer required for Air Force core competency. This meant relying on industry when commercial products met or exceeded Air Force requirements and when business based opportunities existed for partnering/sharing cost. This also meant the Air Force would defer to another service when they were the predominant user or had the preeminent infrastructure, and the other service was willing to host Air Force efforts, and the result reduced the Total Cost to the Air Force. The bottom line was that the Air Force needed to retain RDT&E facilities for the four major product areas (Aeronautical, Space & Missile, C2I, Air Armament) when the Air Force was the predominant user, had preeminent infrastructure, and there was little or no commercial market outside DoD.

PRODUCT SECTOR ASSESSMENT

The four Product Sector Working Groups briefed the results of their internal Air Force study to the OSD OIG on 13 Nov 98. The result of the panel recommendations provided a manpower reduction against a 30 Sep 96 baseline of 5854 authorizations (28%) and a total cost reduction of $362 million (almost 25%) by FY2005. As briefed to OSD, these savings need to be reconciled with current downsizing (such as A-76 actions) and reengineering plans in the current budget submissions.

PANEL RECOMMENDATIONS

Summary

PANEL	RDT&E MANPOWER Authorizations			TOTAL COST (FY96 $M)		
	FY96	FY05	Δ	FY96	FY05	Δ
Aeronautical	12905	8874	- 4031	1063	811	- 252
Space	2296	1709	- 587	130	94	- 36
Air Armament	4654	3532	- 1122	267	198	- 69
C2	1442	1235	- 207	75	64	- 11
Total	21297	15312	- 5947	1535	1167	- 368
Percent Reduction			28%			24%

- Need to reconcile with current downsizing / reengineering plans in the POM
  - Net dollar savings to manpower will be lower than shown when contractor support replaces organic labor in A-76 competitions
- Costs and savings based on review of entire RDT&E workforce
  - Infrastructure portion is a subset of the total-- iteration with other services to ensure consistency as part of refining Cost-Based Management Tool

Exhibit 11

A breakout of initiatives presented by each of the four-product sector groups is presented in the exhibits following this section. The format for each area includes a summary of initiatives identified, along with total annual cost savings for that product area. A product decision-matrix summary and a summary of facility-non-pay support options for each product area follow this.

The OSD ground rules for the RDT&E infrastructure study called for each service to reduce the infrastructure supporting its RDT&E by 25% by FY2005. The Air Force expanded its internal review to include reducing the entire Air Force RDT&E function (not simply the infrastructure), whose savings, as reported by the four Air Force product sectors (Aeronautical, Air Armament, Space, and C^2I, are included in the exhibits that follow.

AERONAUTICAL INITIATIVES

Rely (on other Services)

- Air Force Rotary Aircraft RDT&E to Army (retain service unique mission equipment)
- Army/Navy continue Joint UAV office for short range / low altitude UAVs
- Divest low altitude, tactical IMINT to Navy

Rely (on Industry)

- Commercial airframe for tanker/transport and trainer aircraft (retain organic competencies for military requirements)

Keep

- AF as lead service for medium and high altitude endurance UAVs and future special UAVs (e.g. UCAV)
- AF as lead service for Airborne Directed Energy, Bombers, and Land-Based Fighters
- AF as lead service for medium and high altitude manned airborne reconnaissance/surveillance systems
- AF unique competencies for SOF aircraft RDT&E

AERONAUTICAL RDT&E WORKFORCE/INFRASTRUCTURE
Annual Cost Savings Options

Category	Manpower Baseline	Manpower Saved 01	05	Manpower $ Baseline ($M)	Manpower ($M) Gross Savings 01	05	NPS Baseline ($M)	Non-Pay Support $ Saved ($K) 01	05	Total $ Saved ($M)
Divest		457	542		23.9	28.3		35.6	37.7	65.9
Rely on Commercial			4			0.2			0.3	0.5
Rely on Other Services		5	28		0.3	1.5		-	-	1.5
Keep		86	91		4.5	4.8		0.7	0.4	5.1
BPR		2193	3366		114.5	175.7		3.3	3.5	179.2
TOTALS	12905	2741	4031	673.6	143.1	210.4	389.4	39.6	41.8	252.2
				% Savings	21%	31%		10%	11%	24%

- Need to reconcile with current downsizing (A-76)/reengineering plans in POM
- Net dollar savings to manpower will be lower than shown where contractor support replaces organic labor

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Exhibit 12

AERONAUTICAL RDT&E INFRASTRUCTURE
Product Decision Matrix

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Airborne Directed Energy				X	
Bombers				X	X
Fighters				X	X
Reconnaissance/Surveillance					
Med/High Alt Airborne IMINT				X	X
Low Alt Tact Airborne IMINT			X		
All Other Manned Airborne				X	X
Rotary Aircraft			X		
SOF				X	X
Space Plane				X	X
Tanker/Transport					
Commercial Airframe		X			
Organic Competencies for Mil Req'ts				X	X
Trainer Aircraft					
Commercial Airframe		X			
Organic Competencies for Mil Req'ts				X	X
UAV					
Med / High Alt Endurance UAVs				X	X
Short Range / Low Alt UAVs			X		
Specialized UAVs (e.g., UCAV)				X	X

Exhibit 13

AERONAUTICAL RDT&E INFRASTRUCTURE
Facility - Non-Pay Support (1 of 4)

Facility	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
AFFTC					
EC & Simulation					
Keep/BPR 7 facilities				X	X
REDCAP	X				
Range and AC Ops					
Keep/BPR 15 facilities				X	X
SPORT			X		
Extended Range			X		
X-33 Launch Complex		X			
UTTR (AFMC Test Sites)	X				
Ground Test Facilities					
Keep/BPR 8 facilities				X	X
Barrier Test Facilities			X		
AC Maintenance Facilities					
Keep/BPR 4 facilities				X	X
Instrumentated/Test Support AC					
Keep/BPR 6 facilities				X	X
ARIA	X			X	X
Test & Support AC	X			X	X
Hangers/Office/Warehouse	X			X	

Exhibit 14

AERONAUTICAL RDT&E INFRASTRUCTURE
Facility - Non-Pay Support (2 of 4)

Facility	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
AFRL					
Propulsion and Power					
Keep 4 facilities				X	
Helicopter Rotor Facility			X		
Material and Processes				X	
Civil Engineering					
Pavement Lab			X		
Environment Lab				X	
Airbase Ops Lab				X	
Air Vehicle					
Keep 6 facilities				X	
LDG Gear Lab		X			
Subsonic Aero Lab		X			

Exhibit 15

AERONAUTICAL RDT&E INFRASTRUCTURE
Facility - Non-Pay Support (3 of 4)

Facility	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
AFRL (cont)					
Sensors					
Keep 8 facilities				X	
ATR Site 2 (Bldg 18F)	X				
ATR Site 3 (Trebein Rd)	X				
EO Trans Lab	X				
EM Mat'l Lab	X				
Bi-Static Lab					
Site 1 (Hanscom Prospect Hill)	X				
Site 2 (Hanscom Sudbury)	X				
Human Sys Effectiveness					
Keep/BPR 3 facilities				X	X
Spacial Disorientation/Alt Labs	X				
Sustained Ops					
Keep/BPR 5 facilities				X	X
Sust Ops Labs	X				
Toxicology Support	X				
Select/Class/Retention Lab	X				
Comp Aided Instruction Lab	X				

Exhibit 16

AERONAUTICAL RDT&E INFRASTRUCTURE
Facility - Non-Pay Support (4 of 4)

Facility	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
ASC Engineering					
Divest 12 buildings	X				
Keep/BPR 15 buildings				X	X
OC-ALC					
Keep 5 buildings				X	
OO-ALC					
Landing Gear				X	
F-4 Facility				X	
QL Facility				X	
Eng Home Office (TIE)				X	
WR-ALC					
Keep 6 buildings				X	
AEDC					
Large Wind Tunnels				X	
Small Wind Tunnels				X	
Large/Medium/Small Turbine Eng Cells				X	
Computation Fluid Dynamics				X	

Exhibit 17

AIR ARMAMENT INITIATIVES

Divest

- Aeroballistics Research Facility (FY01)

Rely

- Small guns, most air-to surface guns, ammunition (to Army)
- Tactical propellants (possibly all missile propulsion) (to Navy)
- Explosives chemistry research (retain experimental loading) (to Navy)
- CAD/PAD (Cartridge/Propellant Activated Device) (to Navy)
- Proximity fuses (to Navy)
- Nuclear (to DOE)
- Sub-scale Aerial Target (to Navy)
- Expeditionary Support Systems (to Commercial)

Keep

- "Smart" Air Delivered Weapons (Includes sensors, processors, guidance and control)
  - Could consolidate all DoD, with AF lead
- Hard target penetrators (AF is predominant user)
- Delayed fuses (AF is predominant user)
- Directed Energy Weapons (AF has predominant interest/investment)

Joint

- Propose stand-up Joint Armament Command; Virtual SPD (Navy reviewing)
- Medium-range Air-to-Air Missiles (prior joint agreement)
- Short-range Air-to-Air Missiles (prior joint agreement)

ARMAMENT RDT&E WORKFORCE/INFRASTRUCTURE
Annual Cost Savings Options

Category	Manpower Baseline	Manpower Saved 01	Manpower Saved 05	Manpower $ Baseline ($M)	Manpower ($M) Gross Savings 01	Manpower ($M) Gross Savings 05	NPS Baseline ($M)	Non-Pay Support $ Saved ($K) 01	Non-Pay Support $ Saved ($K) 05	Total $ Saved ($M)
Divest		5	5		0.3	0.3		-	-	0.3
Rely on Commercial		1	1		0.1	0.1		-	-	0.1
Rely on Other Services		24	24		1.3	1.3		-	-	1.3
Keep		49	106		3.0	6.0		0.5	1.1	7.1
BPR		630	986		38.0	60.0		0.3	0.5	60.5
TOTALS	4654	709	1122	254.2	42.7	67.7	12.8	0.8	1.6	69.3
% Savings					17%	27%		6%	13%	26%

- Need to reconcile with current downsizing (A-76)/reengineering plans in POM
- Net dollar savings to manpower will be lower than shown where contractor support replaces organic labor

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Exhibit 18

ARMAMENT RDT&E INFRASTRUCTURE
Product Decision Matrix

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Bombs				X	X
Missiles				X	X
Short Range			X		
Guns & Ammo			X		
Air-to-Air/30mm A-to-S				X	
Directed Energy				X	X
Expendables				X	
TRAP-L				X	
Containers				X	
Arm Handling Equip				X	
Test/Trng & Sup Equip		X	X	X	
Subscale Targets			X		
Full-scale Targets				X	
Wpns Modeling & Sim				X	
Low Observables		X		X	

Exhibit 19

ARMAMENT RDT&E INFRASTRUCTURE
Product Decision Matrix

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Expeditionary Supp Equip				X	X
Fire Suppression PSE		X			
Seekers				X	X
Warheads				X	X
Explosives			X	X	
Fuzes				X	X
Short Rng A-to-A Prox			X		
Guidance, Nav & Control				X	
Armaments Integration				X	
Missile Propulsion				X	
Rocket Propellant			X		
Munitions Certification				X	
Wpns Effects Analysis				X	
Systems Engineering				X	X
Sustainment				X	

Exhibit 20

ARMAMENT RDT&E INFRASTRUCTURE
Product Decision Matrix

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Countermeasures				X	
CCD			X		
Weapons Maint & Storage				X	
Bioeffects				X	

Exhibit 21

ARMAMENT RDT&E INFRASTRUCTURE
Product Decision Matrix

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Countermeasures				X	
CCD			X		
Weapons Maint & Storage				X	
Bioeffects				X	

Exhibit 22

SPACE & MISSILES INITIATIVES

Divest
- Mothball Rocket Test Stands - Edwards AFB
  - No added cost or infrastructure savings

Rely
- Launch vehicle acquisition migrates to purchase of commercial launch services via EELV
  - 25% overall cost savings (to include program costs and launch savings)

Keep
- Air Force is predominant service in Space
- Maintain Space Systems as Core to Air Force
- Consolidate AFRL/VS and AFRL/DE Directorate Support Functions
  - Savings: 1.5%
- Consolidate Los Angeles Air Force Base (Internal, Areas A & B)
  - Savings: Minimal short-term

Joint
- Virtual Satellite Control Network managed as national corporate asset
  - Each service responsible for own infrastructure; capabilities shared
- Directed Energy Technology with AFRL as lead (TriDec Agreement)

SPACE RDT&E WORKFORCE/INFRASTRUCTURE

Annual Cost Savings Options

Category	Manpower Baseline	Manpower Saved		Manpower $ Baseline ($M)	Manpower ($M) Gross Savings		NPS $ Baseline ($M)	NPS $ Saved ($M)		Total $ Saved ($M)
		01	05		01	05		01	05	
Divest		15	15		0.8	0.8		2.2	2.4	3.2
Rely on Commercial										
Rely on Other Services										
Keep	2296									
BPR		497	572		28.0	32.2		0.3	0.3	32.5
TOTALS	2296	512	587	119.9	28.8	33.0	10.0	2.5	2.7	35.7
% Savings					24%	28%		25%	26%	27%

- Need to reconcile with current downsizing (A-76)/reengineering plans in POM
- Net dollar savings to manpower will be lower than shown where contractor support replaces organic labor

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Exhibit 23

SPACE RDT&E INFRASTRUCTURE
Product Decision Matrix

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Spacecraft				X	
Launch Vehicles				X	
Ground Systems				X	

Memo:
- There has been no RDT&E infrastructure or infrastructure cost incurred for nuclear and non-nuclear strike missiles since baseline year 1996. There is no projected RDT&E infrastructure or infrastructure cost within the 1996-2005 timeframe.
- FFRDC does not impact, nor has it ever materially impacted, the infrastructure or infrastructure cost of the Air Force. FFRDC personnel and Air Force personnel are located in each other's facilities on a strictly enforced one-for-one placement. Net result is zero.
- Although covered under the armaments sector, the broader application of directed energy technology remains a core competency of the space sector.

Exhibit 24

SPACE RDT&E INFRASTRUCTURE
Facility - Non-Pay Support

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Los Angeles AFB					
7 Office Bldgs				X	
Office Trailers	X				
Sunnyvale AFB					
"Blue Cube"	X				
Kirtland AFB					
6 Lab Facilities				X	
Battlespace Env Lab	X (Partial)				
Power/Thermal Lab	X (Partial)				
Administration				X	
Storage	X (Partial)				
RDT&E Support Center				X	
Deployable Support				X	

Exhibit 25

SPACE RDT&E INFRASTRUCTURE
Facility - Non-Pay Support (continued)

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Edwards AFB					
4 Test Areas				X	
Area 1-32 (mothball)				X	
Area 1-52 (mothball)				X	
Area 1-56 (mothball)				X	
Area 1-90 (mothball)				X	
Area 1-120 (mothball)				X	
Areas 1-100 & 1-115	X				
NHTF				X	
5 Lab Facilities				X	
S&E Complex				X	
Arnold Eng Dev Center					
5 Test Facilities				X	

Exhibit 26

COMMAND AND CONTROL INITIATIVES

- Co-locate R&D for DoD C4I at Rome Lab facility
  - Includes Joint Coalition, Defense Information Warfare, Next Generation C2
- "Virtual" Collaborative SPO for Cross-Cutting C2 Capabilities and Joint SPOs to Support Specific CINC's C2 Requirements - "System of Systems"
- Consolidate into Joint Service activity w/ AF lead
  - Aerospace C4I Integration, Testbed, Architecture, Modeling/Simulation, Antenna Measurement, Electronic Concepts Simulation, Electromagnetic Effects, C2 Technology Center, Airborne Global Networking
- Divest into Joint Service activity w/ other service lead
  - Reverberation Chamber, Reliability/Maintainability Support
- Terminate Activity
  - VLF/LF, Meteor/Propagation Studies (Verona), HF OTH-B Studies (Ava)
- ASD(C3I) chartered activity separate from OSD Section 912c
  - Similar to "Big 10" approach from Vision 21
  - Joint effort by three service C2 commanders
  - Developing approach that aligns to warfighting CINCs on a "joint" basis
- Stay the Course on Global Awareness, Global Grid, Large Acft T&E
  - Distributed processing and integration of sensors/suppliers
  - Common Communications Environment
  - Large command and control aircraft (work with Aeronautical) Ops Centers - Assessment / Planning / Direction / Feedback

C2 RDT&E WORKFORCE/INFRASTRUCTURE

(Electronic Systems Center)

Annual Cost Savings Options

Category	Manpower Baseline	Manpower Saved 01	Manpower Saved 05	Manpower $ Baseline ($M)	Manpower ($M) Gross Savings 01	Manpower ($M) Gross Savings 05	NPS Baseline ($M)	Non-Pay Support $ Saved ($K) 01	Non-Pay Support $ Saved ($K) 05	Total $ Saved ($M)
Divest		19	19		1.0	1.0		-	-	1.0
Rely on Commercial		34	34		1.7	1.8		-	-	1.8
Rely on Other Services		7	7		0.4	0.4		-	-	0.4
Keep	364									
BPR		42	45		2.2	2.4		-	-	2.4
TOTALS	364	101	105	19.0	5.3	5.5	0.2	0.1	0.1	5.6
% Savings					28%	29%		28%	29%	29%

- Need to reconcile with current downsizing (A-76)/reengineering plans in POM
- Net dollar savings to manpower will be lower than shown where contractor support replaces organic labor

Exhibit 27

C2 RDT&E WORKFORCE/INFRASTRUCTURE

(AFRL at Rome NY)

Annual Cost Savings Options

Category	Manpower Baseline	Manpower Saved 01	Manpower Saved 05	Manpower $ Baseline ($M)	Manpower ($M) Gross Savings 01	Manpower ($M) Gross Savings 05	NPS Baseline ($M)	Non-Pay Support $ Saved ($K) 01	Non-Pay Support $ Saved ($K) 05	Total $ Saved ($M)
Divest		7	7		0.4	0.4	0.9	0.9	0.9	1.3
Rely on Commercial										
Rely on Other Services										
Keep	909			47.7			5.1			
BPR	169	95	95	8.9	4.98	4.98	0.4	-	-	4.9
TOTALS	1,078	102	102	56.6	5.4	5.4	6.3	0.9	0.9	6.2
% Savings					11%	11%		15%	15%	11%

- Need to reconcile with current downsizing (A-76)/reengineering plans in POM
- Net dollar savings to manpower will be lower than shown where contractor support replaces organic labor

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Exhibit 28

C2 RDT&E INFRASTRUCTURE

Product Decision Matrix

(Government engineering functions only)

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
Global Grid					
SATCOM				X	X
Fixed Base			X		
Theater Deployable		X			
Data Links			X		

Exhibit 29

C2 RDT&E INFRASTRUCTURE
Product Decision Matrix
(Government engineering functions only)

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reengineer
C2 Systems (Cross-cutting)					
Industrial Operations	X				
Architecture		X			
General Engineering	X				
Acq. CE		X			
Info Ops/InfoSec				X	X
Global Awareness					
Ground Sensors		X			
Aero Sensors				X	X
Command Centers & Appl.				X	
Modeling & Simulation				X	X
Integration				X	

Exhibit 30

C2 RDT&E INFRASTRUCTURE
Facility - Non-Pay Support

Product Competency	Divest	Rely on Industry	Rely on Other Service	Keep	Business Process Reenginer
Sys Mgt Fac (SMF)				X	
FFRDC (Leased)	X				
C2 Integ Fac (CUBE/EFX)				X	
Mod & Sim (MASC)				X	
AFRL - Rome NY					
Def IW (DIWRAF) Res & Assessment Facility				X	
Info Exploit Facility				X	
Global Comm/Network Research Facility				X	
C2 Technology Center				X	
R & M Facilities	X				
AVA	X				
Forestport	X				
Verona	X				
Newport				X	
Stockbridge				X	

Exhibit 31

CBMT ASSESSMENT

The Air Force agreed with the need for total ownership cost visibility, but the Cost Based Management Tool did not provide this. Although the Air Force developed an auditable process for collecting CBMT data, the data was useful only to establish an FY96 cost baseline for measurement of future trends in cost reductions against this Air Force cost baseline. As a means of measuring inputs to the total cost of ownership process, the CBMT provided some visibility into the types of input to measure. However, existing accounting systems, both at the OSD and Service-level already provided most of this information.

The Cost-Based Management Tool, as its title stated, was a cost of input-driven tool. Without capacity or quality measures, the CBMT could not evaluate best value and was thus unsuited for either intra- or inter-service comparisons. As the DoD begins to implement activity based costing/ management, cost per unit of output data must be measured in any successor management tool.

CBMT ASSESSMENT

- Total cost visibility is critical to cost reduction efforts, but CBMT does not provide this
  - Without capacity or quality measures, the CBMT cannot evaluate best value and is thus unsuited for either intra- or inter-service comparisons
  - As the Air Force implements activity based costing/management, cost per unit output data will be the appropriate data for use in the CBMT (or its successor)
- CBMT data is useful to establish FY96 cost baseline to measure future cost reductions
  - Air Force developed an auditable process for collecting and verifying CBMT data
  - Air Force ready to engage with other Services and OSD to define future data requirements and process

Exhibit 32

Finally, the purpose of measuring input cost and output cost per unit was to identify efficiencies in the RDT&E activity processes. Only limited discussion centered on mapping the processes taking place within RDT&E activities. The Air Force believed there was more value in identifying RDT&E business process efficiencies than in concentrating effort to track activity input costs.

For now, the Air Force believes that OSD can "deploy" the CBMT approach to the Services, rather than engage in periodic inter-service data calls. Each Service can adapt the "deployed" CBMT to track service specific trends and activities on a regular basis, using data from existing accounting systems.

CONCLUSIONS

Even as funding for the Defense Department began to stabilize in the post-cold war era, the Air Force recognized the need for, and began taking action to ensure that Air Force RDT&E infrastructure operated as efficiently as possible. During the course of its internal infrastructure review, the Air Force identified actions that will enhance the performance of its internal infrastructure plans and investigated the potential for additional Cross-Service cooperation.

The Air Force's product sector teams completed and briefed their internal sector reviews to OSD on 13 Nov 98. The Air Force operational community was directly involved in assessing options and building the best value business case. As a result, the Air Force plan represented a corporate Service position that was supported, not only by operational users in the field at Air Combat Command, Air Force Space Command, Air Mobility Command, and Air Education and Training Command, but also by the RDT&E community in Air Force Materiel Command and Air Force Research Lab and the corporate staff at HQ USAF, including the acquisition, logistic, installation, and test/evaluation functions. The result of that review includes the following conclusions:

1. The Air Force led the effort in developing a "smart business" approach to RDT&E infrastructure reductions. Even before Section 912 actions, the Air Force began to identify opportunities to better structure its own infrastructure and develop internal service options to reduce cost. The result of that internal look, combined with OSD and congressional Section 912 actions, is that Air Force warfighters are provided "best value" as the Air Force RDT&E community balances organic infrastructure with reliance on other services, agencies, and the private sector.

2. The mission of the Air Force is to defend the United States through control and exploitation of air and space. The Air Force continues to dominate the four product sectors central to its mission: Aeronautical / Air Armament / Space / C2I. Although there are efficiencies that can be realized in DoD and the other Services by "leveraging" the Air Force's RDT&E infrastructure for joint Service potential, the Air Force must retain that RDT&E infrastructure which is central to Air Force Core Competency, particularly in Aerospace, Aeronautical, and Air Armament systems.

3. The Air Force will continue to streamline its RDT&E infrastructure to ensure its core competencies. The Service developed a sound process to determine the appropriateness of keeping organic RDT&E infrastructure in place, leveraging joint cooperation, or relying on industry. The Air Force is correctly "positioned" in its weapon system product sectors to identify and transition technology to industry.

4. As the Air Force continues to meet warfighter needs, it will "buy down risk" largely through outsourced engineering development and acquisition. In fact, greater reliance and partnering with industry is the best opportunity to reduce Air Force infrastructure costs.

5. The Air Force will meet or exceed OSD's infrastructure cost reduction goals of 10% by FY01--25% by FY05. Most of these savings result from reengineering and outsourcing and most are already POM'ed in the FYDP. Projected savings do not include

adjustments for A-76 actions, which will vary depending on whether the government or commercial sector wins A-76 competitions.

6. The Cost Based Management Tool (CBMT) provides a useful "meter" for cost reductions, but a poor "metric" for comparison either across service product sectors or between services. As a means of measuring <u>inputs</u> to the total cost of ownership process, the CBMT provided some visibility into the types of input to measure, but existing accounting systems already provide most of this information.

7. Without capacity or quality measures of output, the CBMT cannot evaluate best value and is thus unsuited for either intra- or inter-service comparisons. As the DoD begins to implement activity based costing/management, cost per unit of <u>output</u> data must be measured in any successor management tool. The purpose of both measuring input cost and output cost per unit is to identify efficiencies in the RDT&E activity processes. The Air Force believes there is more value in identifying RDT&E business process efficiencies than in concentrating effort to track activity input costs.

<u>RECOMMENDATION</u>

The Air Force developed and is committed to carrying out its Internal Service Plan that will generate approximately $362 million in savings through FY05. The Air Force will continue to downsize in place and reduce cost while preserving individual Service <u>core</u> competencies. These savings are substantial--meeting or exceeding OSD's infrastructure cost reduction goals of 10% by FY01 and 25% by FY05--and have either already been realized or are programmed in the Air Force FY01 APOM.

As OSD develops its implementation plan, the Air Force recommends that combining Air Force savings with those achieved in both the internal plans of the other Services and the Cross-Sector plans should be the basis for the DoD Section 912c Report to Congress. Further implementation of these plans ensures that each Service will retain core RDT&E competency for those areas central to accomplishing aerospace missions in support of the national military strategy. The Air Force will continue to work together to identify Joint Service consolidation options at the facility level, but is unwilling to give up or relinquish Service individual core competencies.

Finally, the Air Force advocates that OSD "deploy" the CBMT approach to the Services, rather than engage in periodic inter-service data calls. Each Service can adapt the "deployed" CBMT to track service specific trends and activities on a regular basis, using data from existing accounting systems.

DEFENSE THREAT REDUCTION AGENCY

RDT&E INFRASTRUCTURE

March 1999

Defense Threat Reduction Agency
45045 Aviation Drive
Dulles, VA 20166-7517

INTRODUCTION

This report provides the Defense Threat Reduction Agency (DTRA) inputs for the USD(A&T)-directed study addressing streamlining of DoD RDT&E infrastructure. It focuses on DTRA applied technology (Program 6.2) RDT&E infrastructure, which is part of S&T programs that develop improved military capabilities. It does not include RDT&E or other infrastructures supporting Cooperative Threat Reduction (CTR) and arms control treaty verification programs. It also does not include Chemical-Biological Defense (CBD) RDT&E infrastructure, predominantly within the Army, that supports execution of the agency's CBD responsibilities.

The report responds to tasking from OSD by presenting a vision for the DTRA RDT&E activities described, identifying factors that are unique to DTRA S&T infrastructure, and presenting the draft DTRA RDT&E infrastructure plan.

RDT&E VISION

The DTRA vision for the S&T programs and associated technical infrastructure addressed in this report is to:

> Accomplish the applied research needed to redress current WMD threat reduction capability shortfalls and counter emerging threats with programs that respond to the full range of WMD threats to the United States and its allies, including those posed by nuclear, radiological, chemical, biological, special, and conventional weapons and any other threats than can cause large numbers of casualties and/or extensive damage to facilities or systems.

Realizing this vision requires development and demonstration of the technological capabilities needed to respond to the full range of WMD challenges, encompassing counterproliferation, WMD terrorism, and sustainment of the capabilities needed to hedge against a potential peer adversary confrontation. The agency's task is to serve as the national center for applied research directed at these challenges, coordinating with and integrating related external programs as appropriate.

Concurrently, DTRA is the department and national lead for applied research to develop the capabilities needed to accelerate implementation of current programs to prevent, eliminate, deter, withstand, and prevail against WMD threats, and to provide the technical underpinnings required for new and more effective WMD threat reduction policies and programs that are balanced, affordable, and innovative.

Technical efforts responsive to the agency's vision involving conducting RDT&E and providing technical support to DoD Components and other organizations, as appropriate, in areas related to WMD and designated advanced weapons. Specific technical missions are to:

- Evaluate the lethality of U.S. and other nuclear and radiological weapons against a broad spectrum of target types in warfighting and terrorist scenarios.

- Evaluate the lethality of designated advanced weapons, to include enhanced payload options, weapon/target interactions, options for defeat of counterproliferation and terrorist threats, target-induced and other collateral effects associated with attacks against WMD-related targets, and the entire class of hard and deeply-buried facilities.

- Assess and enhance the survivability and operability of weapons systems, C4I systems, forces, and infrastructure to the effects of nuclear weapons, other WMD, and designated advanced weapons through development of new concepts for cost-effective life-cycle operability, improved hardness design/testing protocols, and testable hardware prototypes.

- Serve as DoD focal point for development, demonstration, and production of radiation-resistant microelectronics, materials, and electro-optics, and for integrated hardening of such components to the full spectrum of electromagnetic hazards.

- Develop, maintain, and apply state of the art capability (including testbeds and simulators) for modeling, simulating and testing effects, capabilities, and consequences of nuclear, other WMD, and advanced weapons in warfighting and terrorist scenarios.

- Capture and preserve nuclear weapons effects test data and maintain a DoD readiness to resume underground nuclear effects testing, if directed.

- Manage the Nuclear Test Personnel Review Program and the DoD Radiation Experiment Command Center.

- Preserve critical technical nuclear competencies through applications to other mission areas of DTRA and by others means; maintain coordination and collaboration with other DoD Components and the Department of Energy on technical matters impacting stockpile stewardship; and maintain the technical capabilities needed to support coordination and accomplishment of strategic system sustainment.

Test, simulator, and simulation (virtual testing) activities are integral to these RDT&E activities. Realistic testing is the only way in which to validate survivability, a lesson learned during the underground test program, where a number of systems that were believed to be sufficiently hardened based on pre-test calculations failed when exposed to physical effects. The same point holds for evaluation of munition options.

All of the technical infrastructure addressed in this report is coordinated through the department-wide Defense Reliance/Defense Science and Technology processes under DDR&E oversight. The preponderance of the facilities that are programmed to continue provide technical capabilities needed for accomplishment of approved Defense Technology Objectives.

CONSIDERATIONS UNIQUE TO DTRA RDT&E INFRASTRUCTURE

A number of points involving the DTRA technical infrastructure addressed in this report merit attention.

DTRA is the only DoD Component with Nuclear S&T (Program 6.1-6.3) investments, as documented in both the most recently published and draft Defense Technology Area Plan. To the extent that the objective is to reduce or eliminate redundancies between DoD Components, for nuclear S&T programs this has already been accomplished.

The DTRA technical capabilities being discussed are unlike many of the T&E infrastructure found elsewhere within DoD, e.g., within the military departments. DTRA does not have test ranges or similar facilities that are used to support system development and evaluation in the later stages of the acquisition process. DTRA and predecessor organizations have not maintained in-house lab and test organizations comparable to those found elsewhere within DoD; practice has been to outsource to the maximum extent possible. The facilities described are part of a 6.2 S&T program; they are the scientific apparatus needed for experiments to be conducted. A decision to eliminate the apparatus is, effectively, a decision to halt the S&T activities supported.

The establishment of DTRA was one of the primary decisions made in the Defense Reform Initiative. Current DoD procedures and processes were used to review and revalidate all aspects of the agency's mission and programs. This included a department-wide review prior to approval of the DTRA charter (DoD Directive 5105.62, September 30, 1998), which provides the basis for the RDT&E vision presented in the previous section of this report for which the facilities being addressed are enabling technical capabilities. These processes also included a Nuclear Weapons Effects (NWE) Simulators Study Group with the mandate:

> The NWE Study Group will identify continuing DoD requirements for nuclear effects simulators and identify facilities, infrastructure, and organizational structure to adequately support customer requirements.

This study group concluded that DoD needed to sustain core NWE competencies and that DTRA simulators did not duplicate capabilities within DoD, DOE, or elsewhere.[1]

Additionally, a working level integrated product team on non-nuclear field testing needs was also reviewed. The group verified that the DTRA field testing capability is unique and supports key missions of the new agency, including counterproliferation, anti-terrorism, and hard target defeat programs. It was further upheld that devolving these capabilities from DTRA would have serious cost and schedule inputs on time-urgent, high visibility WMD programs and erode critical nuclear skills.

---

[1] Nuclear Weapons Effects (NWE) Simulators Study Group Final Report, June 17, 1998.

Any revalidation of requirements that might be required as part of the current study effort have already been accomplished. The DTRA mission is a DRI mandate for consolidation, not fragmentation, of WMD-related capabilities.

The capabilities presented are also impacted by national and departmental guidance. Presidential direction requires that a capability to resume underground testing be retained at the Nevada Test Site. While steps have been taken to minimize the costs associated with test readiness by employing the tunnel facilities for other purposes, the requirement would exist irrespective of cost or approach. Furthermore, the facilities presented are integral to the department's efforts to sustain core technical strategic competencies, as presented by the Secretary of Defense in his May 1997 report to Congress on DoD Nuclear Weapon Systems Sustainment Programs.

The NWE Study Group referenced above gave explicit consideration to DOE nuclear capabilities. It concluded that DoD and DOE had different technical nuclear missions (nuclear weapons vs. nuclear effects). In its input to the NWE Study Group, the Department of Energy stated that:

> For activities now performed by DSWA, we do not see the transfer of either functions or facilities to DOE as an appropriate path at this time.
>
> DOE and DSWA have established and maintained strategic alliances to preserve and develop unique radiation simulation capabilities.
>
> DOE has not planned modifications or upgrades to specifically support DoD effects testing. Such modifications or upgrades would require DoD funding.
>
> The DOE considers that it is important for DoD to maintain its NWE research and development base, and with it the necessary experimental facilities.[2]

Reliance has also studied what is now the DTRA technical capability for nuclear weapon effects simulation. This Reliance appraisal gave explicit consideration to potential use of DOE facilities as alternatives. The programmed capability is along the lines recommended by the Reliance task force.

Current DTRA planning envisions even closer cooperation with DOE, to include collaboration with DOE's Accelerated Scientific Computing Initiative (ASCI) to develop virtual test capabilities for situations in which realistic full-scale physical testing is not possible, and a DoD effects add-on for the DOE National Ignition Facility (NIF).

Another consideration involves the ongoing reconfiguration of the DTRA capability for nuclear effects simulation. At the end of the Cold War, there was a capability/capacity mismatch. With the end of underground testing, improved simulators were needed, to include enhancements for the fidelity of effects that could be simulated and with respect to the size of objects that could be

[2] Nuclear Weapons Effects (NWE) Simulators Study Group Final Report, June 17, 1998.

tested. To this end, a deliberate decision was made to close some existing facilities to make resources available for improved simulators. The results of this consolidation have been in large part responsible for the facility closures and associated savings presented in the next section.

A final consideration involves the DTRA mission. While the Cold War is over, NBC threats remain. It is because of these WMD threats that the DRI directed establishment of DTRA. In broad terms, there are three current WMD defense missions:

Deter adversaries and reassure allies. The principal challenge here is to develop and apply the technologies needed to sustain the survivability and effectiveness of strategic systems. This includes collaborations with DOE in ASCI and other technical programs.

Counter adversary use of WMD as an asymmetric threat to offset U.S. conventional superiority during a regional crisis or war. One objective is to disincentives WMD use by developing the technologies needed to provide protection against wide-area, persistent NBC effects. A related goal is to provide protection to mission-critical systems and infrastructure. Another technical objective is to develop the capabilities needed to deny sanctuary to WMD and associated C3, holding hard to kill targets at risk with discriminate lethality weapons and with minimized target-induced collateral effects.

Become impervious to terrorist and other WMD threats and attacks. Technology priorities here include technical support to DoD responders, agent defeat/neutralization, full dimensional protection, and protection for infrastructure and assets.

The full scope of these missions is still under definition. For example, in January 1999, the President will report to Congress concerning DoD and other programs to better counter WMD terrorist threats in accordance with Presidential Decision Directive 62. As a result, while the technical capabilities presented in the next section provide the baseline for responding to revalidated current mission requirements, there are likely to be new requirements for technical infrastructure directed at new mission needs that are not reflected in this baseline.

RDT&E INFRASTRUCTURE PLAN

CONSOLIDATION

Streamlining of DTRA technical testing facilities is as outlined in Table 1. This consolidation and focusing of technical capabilities has been accomplished within the parameters presented previously in this report.

With respect to the FY96 baseline developed for this study, by FY01 the anticipated reduction in testing facility expenditures on technical infrastructure will have achieved the 10% goal ($7M). In FY99, DTRA will request from the Defense Science Board to review all remaining simulators to study the need for maintaining the suite of unique T&E facilities or mothball several of them. Depending on the independent review results, the agency will then evaluate a proper course of action and validate if a 25% goal by FY05 is achievable.

OUTSOURCING

There are no in-house labs to divest. DTRA already outsources to the maximum extent possible. To the extent possible, technical facilities are located on military department campuses because this results in efficiencies.

CROSS-SERVICING

All nuclear S&T and supporting technical capabilities have already been consolidated within DTRA.

STREAMLINING, PARTNERING, AND DIVESTING

The WIPT that addressed NWE simulation capabilities concluded that divestiture was not appropriate. As recommended by DOE, DoD needs to retain a core set of technical nuclear competencies. The remaining (sole) subset of such competencies is the DTRA program.

DTRA plans increased cooperation with DOE. That department plans to invent and utilize a new generation of computational capabilities to accomplish nuclear stockpile sustainment. DTRA will collaborate, both to ensure that DoD is an informed, competent partner for shared stewardship responsibilities and to make use of capabilities that partially redress the capabilities lost due to the termination of underground nuclear testing.

Partnering with private industry, academia, or other agencies is already DTRA's standard business practice. MOAs are already in place with the key DOE national labs.

Table 1. DTRA 6.2 T&E Infrastructure

LOCATION NAME	CLOSED	FACILITY	DESCRIPTION OR DELETION RATIONALE
Maxwell Physics Int'l Corp, San Leandro, CA		Double-EAGLE	Warm to hot x-ray simulator in the moderate energy range, with cold x-ray plasma radiation source capability
Maxwell Physics Int'l Corp, San Leandro, CA		Modular Bremsstrahlung Source (MBS)	Warm x-ray simulator in the lower energy range
Maxwell Physics Int'l Corp, San Leandro, CA		PITHON	Hot x-ray simulator in the moderate energy range, with electron beam mode and cold x-ray PRS capability
Maxwell Physics Int'l Corp, San Leandro, CA		Fast Rise Electromagnetic Pulse Simulator (FEMPS)	Vertical dipole EMP radiation simulator with anechoic exposure chamber
Maxwell Physics Int'l Corp, San Leandro, CA		PR1150	Variable pulsewidth gamma simulation
Maxwell Physics Int'l Corp, San Leandro, CA	Jan 98	HPM/MPM Facilities	High power & medium power microwave test capability
LOCATION NAME	**CLOSED**	**FACILITY**	**DESCRIPTION OR DELETION RATIONALE**
Maxwell Labs, San Diego, CA	Sep 95	Blackjack 3	Low energy electron beams with cryogenic test capability
Maxwell Labs, San Diego, CA	Sep 95	Blackjack 5	Soft x-ray test support capability
Maxwell Labs, San Diego, CA	Sep 95	MBS	SGEMP test capability transferred & consolidated at DTRA's DECADE Facility AEDC & is operational 5/97
ARL Adelphi, MD	Sep 95	AURORA	World's largest fluence area gamma & high energy Ion beam testing simulator
NSWC, White Oak, MD	Sep 96	Phoenix	Premiere cold x-ray test support facility

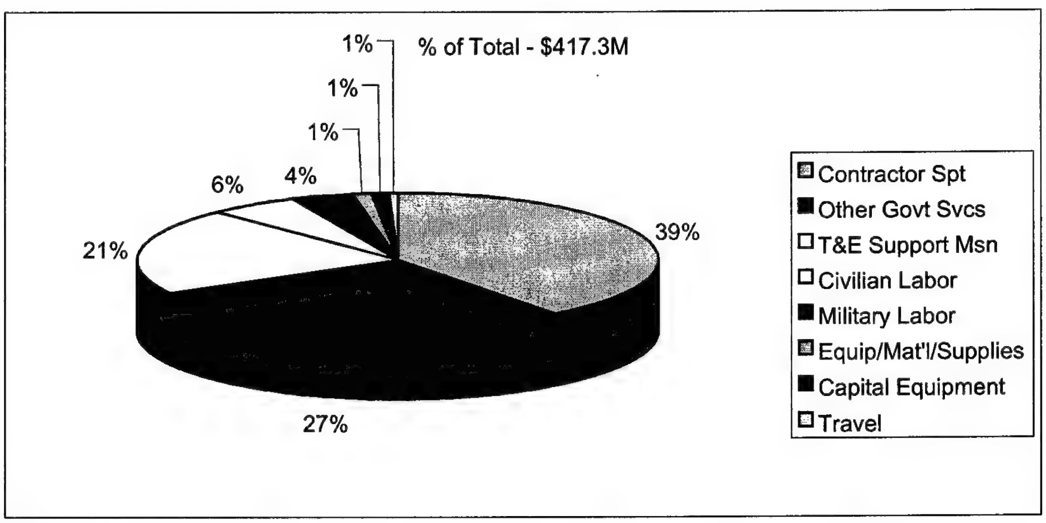
NSWC, White Oak, MD	Sep 96	Casino	High intensity brems, cryogenic Electron Beam simulator
NSWC, White Oak, MD	Sep 96	Tags	Fast risetime gamma-test simulator shutdown but technology was integrated onto the PR1150 simulator
Arnold Engineering Development Center, TN		DECADE Radiation Test Facility	New state-of-the-art ionizing radiation test facility and future home of the DECADE dual purpose x-ray simulator
Tullahoma, TN		AEDC Modular Bremsstrahlung Source (MBS)	X-rays for SGEMP, dose enhancement, box IEMP, TREE and cable testing
Kirtland AFB, NM		Advanced Research EMP Simulator (ARES)	Vertically polarized E-field High Altitude Electromagnetic Pulse (HEMP) simulator, Nation's only large volume facility
Kirtland AFB, NM		Civil Engineering Research Facility (CERF/GRAB)	Three horizontal shock tubes (20'x825', 2'x190',7"x50') provides a full range of shock tubes for airblast tests and blastvalve tests
			120 acre test range constructed of selected soil materials for high explosive and special weapons effects testing
Kirtland AFB, NM		Impact Facility-Mag Flyer Plate, Building #766	Three gas guns and the U.S.'s largest magnetic flyer for investigation of material response, where geometry is not a factor
Kirtland AFB, NM	Apr 98	Thermal Radiation Simulator (Coyote Canyon)	Facility mothballed & the thermal pulse effects testing capability is now consolidated at LBTS
WSMR, NM		Large Blast/Thermal Simulator (LBTS)	Multi-service facility for full size testing up to main battle tanks, aircraft and ship components - replicates blast and thermal signatures
WSMR, NM		Permanent High Explosive Test Site (PHETS)	Provides numerous instrumented test beds for RDT&E of air launched weapons, advanced weapon concepts and weapon phenomenology
Wright-Patterson AFB, OH	Sep 97	Tri-Service Thermal Facility	Produces nuclear thermal simulation with correct black body temperature & pulse shape. Consolidated at Kirtland AFB Build #674 next to ARES
Nevada Test Site, Mercury, NV		Nuclear Test Site	Unique test facility that supports both nuclear and non-nuclear testing, maintaining UGT readiness and hard-target tunnel testing
Miramar NAS, CA	Oct 99	Green Farms Gun Test Facility	Electro, thermal, chemical/electromagnetic gun research and development test facility (Closing Decision still in process)
Other DTRA Activities			

Table 2. DTRA Facility/Lab Baseline ($M)

*Note: Excludes Labor	Overhead	Direct	Total
Maxwell/PI Facilities, CA	0.792	12.127	12.919
ARL, MD	0.134	2.055	2.189
NSWC, White Oak, MD	0.074	1.135	1.209
AREDC, TN	0.084	1.284	1.368
DTRA Kirtland AFB, NM	1.554	23.802	25.356
DTRA WSMR, NM	0.907	13.894	14.801
NTS, NV	0.513	7.869	8.382
Wright Pattrick AFB, OH	0.012	0.189	0.201
Miramar NAS, CA	0.270	4.135	4.405
Other DTRA Activities	18.911	289.746	308.657
Total	**23.251**	**356.236**	**379.487**

SAVINGS BY TAXONOMY AREA

Table 3. DTRA Reported Baseline Taxonomy (Financial Metrics)



**NOTE:* *During the DoD IG review, DTRA addressed the issue that the CBMT data had omitted Foreign Military Case (FMS) data. All graphs use the corrected (including FMS) data.*

This baseline table depicts the percentage of funding associated with each reported financial metric area found in the CBMT. DTRA intends to realize its initial FY00 savings in the T&E Mission Support Area. The FY05 goal shall be met by balancing savings across several taxonomy areas such T&E Mission Support, Contractor Support, and Other Government Services. If it is decided that a simulator is shut down at a government facility, then the government services at that facility will not be needed. If DTRA's R&D commercially run simulators are shut down or mothballed, then limited Contractor Support would be needed. However, this is premature until the Defense Science Board study is completed.

PORTIONS OF SAVINGS ALREADY INCLUDED IN THE DTRA POM.

Table 4. DTRA Facility/Lab Divestments (Sep 95-Oct 99) ($M)

*Note: Excludes Labor	Overhead	Direct	Total	Comments
ARL, MD	0.134	2.055	2.189	Closed 30 Sep 95
NSWC, White Oak, MD	0.074	1.135	1.209	Closed 30 Sep 96
Wright Pattrick AFB, OH	0.012	0.189	0.201	Closed 30 Sep 97
Miramar NAS, CA	0.270	4.135	4.405	To be closed 30 Oct 99
Maxwell/PI Facilities, CA	0.792	12.127	12.919	In POM/DSB review FY99/Action after FY00
AREDC, TN	0.084	1.284	1.368	In POM/DSB review FY99/Action after FY00
DTRA Kirtland AFB, NM	1.554	23.802	25.356	In POM/DSB review FY99/Action after FY00
DTRA WSMR, NM	0.907	13.894	14.801	In POM/DSB review FY99/Action after FY00
NTS, NV	0.513	7.869	8.382	In POM/Growth Area-Hard Tgt Defeat
Other DTRA Activities	18.911	289.746	308.657	In POM/Growth Area Core WMD Programs
Total	**23.251**	**356.236**	**379.487**	

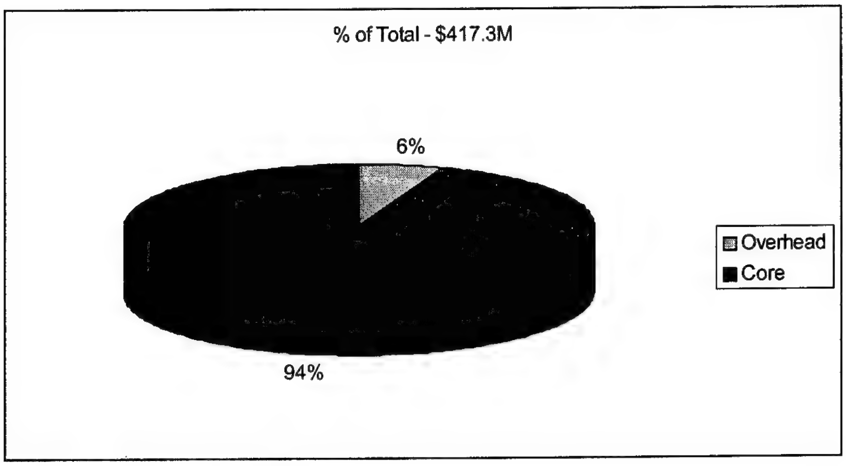
PORTIONS OF SAVINGS THAT ARE INFRASTRUCTURE DOLLARS VERSUS PROGRAM DOLLARS.

Unlike the military departments, DTRA does not maintain T&E infrastructure. The facilities listed are part of S&T programs funded using program funds. Using the Financial Metrics Taxonomy, we have separated overhead costs from core program associated costs. Proportions are:

Table 5. DTRA FY96 Overhead, Core Program & Associated costs by FM Taxonomy

		Overhead	% Overhead	Core	% Core	Total	% Grand Total Overhead	% Grand Total Core	% Grand Total
FM1	Military	1252.00	7.6%	15128.00	92.4%	16380.00	**5.2%**	**3.8%**	**3.93%**
FM2	Civilian	5932.00	25.6%	17196.00	74.4%	23128.00	**24.5%**	**4.4%**	**5.54%**
FM3	Travel	115.84	4.5%	2459.00	95.5%	2574.84	**0.5%**	**0.6%**	**0.62%**
FM4	Contractor Spt	7446.40	4.5%	158063.00	95.5%	165509.40	**30.8%**	**40.2%**	**39.66%**
FM5	Other Govt Svcs	5144.12	4.5%	109193.00	95.5%	114337.12	**21.3%**	**27.8%**	**27.40%**
FM6	Equip/Mat'l/ Supplies	214.78	4.5%	4559.00	95.5%	4773.78	**0.9%**	**1.2%**	**1.14%**
FM9	T&E Support Msn	3870.59	4.5%	82160.00	95.5%	86030.59	**16.0%**	**20.9%**	**20.62%**
FM13	Capital Equipment	204.27	4.5%	4336.00	95.5%	4540.27	**0.8%**	**1.1%**	**1.09%**
	Grand Total	**24180.00**	**5.79%**	**393094.00**	**94.21%**	**417274.00**	**100.00%**	**100.00%**	**100.00%**

Table 6. DTRA FY96 Overhead and Core Program Percentage Breakout



PORTION OF PERSONNEL SAVINGS THAT WILL BE BROUGHT BACK BY A-76 ACTIONS OR OTHER MEANS

DTRA is participating in the Section 912(B) study that has defined critical Acquisition and Technology FTEs. DTRA has reported 143 FTEs (military and civilian) as part of that study. USD(A&T) has accepted DTRA's data. It is imperative that the results of the Section 912(B) study and the Section 912(C) study be correlated so that double accounting does not occur.

PROCESSES TO ACHIEVE STREAMLINING

Unlike the military departments, the organizations that were brought together to constitute DTRA did not have large in-house laboratory and T&E establishments. The preponderance of the agency's S&T involves 6.2 funds; most military department 6.2 programs are intramural. The underlying rationale for much of this review is to right-size in-house infrastructures of types that aren't found within DTRA.

The agency's T&E has a different character than is the case for much of the military department T&E infrastructure. DTRA T&E is integral to its S&T program; much of the military department infrastructure supports later-stage-in-acquisition process system development.

As part of the DRI-directed agency establishment process, DTRA T&E was scrutinized and validated by an OUSD(A&T)-chaired WIPT. Prior to this WIPT, these and other technical programs and capabilities were examined in congressionally directed Defense Science Board, OSD/JCS, and RAND Corporation reviews. More recently, an internal review resulted in the assignment of T&E-related facilities to the directorates responsible for use of these capabilities within their R&D programs.

End State Results

It is imperative that this study recognize that DTRA through the DRI and WIPT process is a newly formed organization with previously validate unique and newly formed missions. The strategic reality is that WMD threat reduction S&T challenges have increased for DTRA. As the agency develops the technical capabilities needed to counter new and/or newly appreciated threats, increases in this baseline will probably be needed to validate the expanded missions against WMD attack prevention, terrorist threats, and demonstrate the effectiveness of newly developed technology solutions.

Streamlining the Test & Evaluation Infrastructure

Joint Interoperability Test Command **19NOV98**

Introduction. The Director, Test, Systems Engineering and Evaluation (DTSE&E) directed the Joint Interoperability Test Command (JITC) to provide a plan for streamlining our test and evaluation infrastructure with the objective of establishing the right-sized capability to achieve the required levels of effectiveness as outlined in Joint Vision 2010 (JV 2010). Our initial tasking is to develop a vision for the future JITC test and evaluation and to identify the minimum infrastructure required to support our vision.

Before we can develop a vision on the test and evaluation infrastructure that will be required to provide the full lifecycle support for Command, Control, Communications, Computers, and Intelligence (C4I) systems, we must first understand the national vision for joint and coalition warfare as outlined in JV 2010. That is, our C4I test and evaluation vision must dovetail with the Department's vision for achieving the objectives outlined in JV 2010.

Within the JV 2010 discussion, the Chairman identified four new operational concepts: dominant maneuver, precision engagement, full dimensional protection, and focused logistics. As outlined in JV 2010, the basis for these new operational concepts will be assured by information superiority.

> *The fusion of all-source intelligence with the fluid integration of sensors, platforms, command organizations, and logistic support centers will allow a greater number of operational tasks to be accomplished faster. Advances in computer processing, precise global positioning, and telecommunications will provide the capability to determine accurate locations of friendly and enemy forces, as well as to collect, process, and distribute relevant data to thousands of locations. Forces harnessing the capabilities potentially available from this system of systems will gain dominant battlespace awareness, an interactive "picture" which will yield much more accurate assessments of friendly and enemy operations within the area of interest. (Source: JV 2010)*

The achievement of a fully fused and fully integrated battlespace will depend on the degree of interoperability and integration of the C4I systems that support the joint and combined operations of the sensors, weapons platforms, and Command and Control (C2) centers. Given the explosion of technology within the information systems arena, as well as the rapid insertion of this technology within the various theaters of operation, the criticality of joint and combined interoperability will increase several orders of magnitude as these new technologies are integrated into the existing inventory of C4I systems.

As pressure increases on the Service program managers to quickly deliver new capabilities for specific Service purposes, the need increases for a joint test capability to ensure that the broader JV 2010 objectives of full information superiority are met. That is, a joint test element is required to ensure that the joint and combined C4I system requirements complement the mission of Service test elements and that the desired functionality is achieved.

For information systems, the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD(C3I)) and the Joint Staff assigned JITC the mission of testing and certifying C4I systems for joint and combined compatibility, integration, and interoperability for the Department of Defense (DoD). Additionally, the Director, Operational Test and Evaluation (DOT&E) designated JITC as the Operational Test Agency (OTA) for joint systems acquired by the Defense Information Systems Agency (DISA). As such, JITC is one of the five designated OTAs and is the sole joint OTA within the Department.

The following two sections address (1) the joint and combined C4I compatibility, integration, and interoperability mission and (2) the OTA mission for joint information systems. Each section provides the background for the mission area, the vision for the future of that mission area, and the infrastructure required to support the mission area. The joint and combined compatibility, integration, and interoperability mission area is further divided into communication systems, command and control systems, and intelligence systems.

Section 1. Joint and Combined Interoperability

A. Background. As a result of joint and combined information systems interoperability problems that reduced the mission capabilities of the Coalition Forces during Desert Shield/Desert Storm, the ASD(C3I) reissued the directive that stated, "That, for purposes of compatibility, interoperability, and integration, all C3I systems developed for use by US Forces are considered for joint use." (Reference: DoDD 4630.5, dated 12NOV92) Additionally, the Joint Staff issued an instruction that stated that the Joint Interoperability Test Command (JITC) will "... certify that applicable standards and requirements for compatibility, interoperability, and integration have been met and the system meets criteria for joint or combined use." (Reference: CJCSI 6212.01A, dated 30JUN95) Additionally, this instruction expanded C3I to C4I to include the combat support information systems that directly supported the joint warfighter.

Currently, JITC follows the processes outlined in CJCSI 6212.01A with respect to accomplishing the joint interoperability test and certification mission. This mission includes the following efforts:

- X Review of Mission Need Statements (MNSs) and Operational Requirements Documents (ORDs).
- X Review of program managers' test plans.
- X Compatibility, interoperability, and integration assessments.
- X Joint interoperability certification and re-certification.
- X Lifecycle support.

1. Definitions. The aforementioned directives and instructions reference compatibility, interoperability, and integration in the discussion on achieving a seamless information flow throughout the battlespace. While interoperability is the primary focus, the compatibility and integration issues are equally important. The focus of our discussion will center around interoperability; however, we will discuss compatibility and integration as appropriate.

With respect to compatibility, this feature is best assessed during the standards conformance testing. Along with the more common aspects of compatibility such as radiated emissions, we also examine the adherence to standards that frame such items as data elements. That is, during the examination of the compatibility of information transfer, we look at source to target compatibility of data fields, and consistency of units of measure associated in data elements.

With respect to integration, this feature is best assessed during the field assessments of the C4I systems during exercises and contingencies. While a system may emerge as compliant with the appropriate standards and interoperate in a structured testing environment, the integration of this system into the operational network oftentimes experiences significant shortfalls.

With respect to interoperability, there are many thoughts on what the true meaning of interoperability might be. Prior to engaging in the interoperability certification mission, we must have a common reference point as to the definition of interoperability. As a means of a common focus, we have adopted the following definition which captures the basic essence of interoperability:

> *Interoperability is the ability of* ***people, procedures****, and* ***equipment*** *to operate together effectively and efficiently under all conditions of battle.*

Acquisition folks will frequently discuss the ever-elusive interoperability solution in terms of creating the perfect standard or comprehensive requirement. As those familiar with acquisitions know all too well, the pursuit of requirements perfection is a futile and frustrating effort. Interoperability is not a static state that can be achieved simply by the satisfaction of technical requirements. Interoperability is an ideal condition which can be approached but never totally achieved because of the dynamic nature of military operations and C4I acquisitions. While the achievement of technical requirements is absolutely essential in the early stages of the acquisition, the people and procedures aspects of interoperability are vital, and must be considered and addressed throughout the acquisition life-cycle.

2. Requirements. Interoperability requirements are equally as elusive and complex as the various interoperability definitions. While other requirement documents exist, the following sources of requirements form the basis of interoperability assessments and certifications:

- X Joint Technical Architecture (JTA). This document identifies the set of standards to be implemented within DoD acquisitions. The objective of the JTA is to provide a technical framework for the acquisition.

- X MNSs and ORDs. These documents outline the users requirements as validated by senior DoD management.

X Operational Employments. As the operational world continually adjusts assets to address changing threats, the acquisition community experiences great difficulty in modifying ongoing acquisitions to incorporate the CINC's ongoing adjustments. Hence, the MNS/ORDs of yesterday are often outdated and incomplete. To bridge the gap between the acquisition and operational worlds, JITC conducts field assessments of C4I systems during CINC exercises and contingencies. In addition to verifying the C4I interoperability certifications, JITC documents the differences between the MNS/ORDs and the operational employments of C4I systems in the CINC exercises and contingencies. This information is used by: (1) the JITC test departments to tailor the interoperability certification requirements to address the C4I field operations and (2) the Joint Staff to update C4I MNSs and ORDs.

3. Scope of C4I Interoperability Assessments. While each C4I system presents unique challenges, we can divide the interoperability assessments into two basic elements: information transport and information processing. In the very generic sense of the word, we define information to be voice, text, data, and imagery.

The interoperability issue with information transport is the complete, accurate, and timely transfer of information from one system to another. The objective of this testing is to assess the ability of the system to send and/or receive information in its intended operational environment as described in the MNS and ORD for that system, and as documented in the JITC field assessments.

As an example, we assess tactical communications equipment in terms of supporting a notional Joint Task Force (JTF). While the Services acquire the tactical communications equipment with their specific Service requirements, our focus is determining the degree of integration and interoperability of each tactical communications system with respect to the overall communication requirements of the JTF. JITC assesses the ability of these systems to support data, text, voice, and imagery from the source functional element to the target functional element.

With respect to information processing, the interoperability issue is the appropriate integration and interpretation of received information with the intent of presenting a new set of information for display or further processing by another system. The objective of this testing is to assess the ability of the system to process and present information in the operational environment.

As an example, the command and control systems that support the theater air and missile defense are assessed in terms of: detection, message transfer, combat identification, reporting responsibility, system queuing from organic and remote sources, coordination of engagements, multiple simultaneous engagements, accuracy and timeliness of information, common tactical picture, and track deconfliction. It is imperative that this information be accurate and timely for the warfighter to effectively identify and neutralize enemy strike packages without incurring loss of friendly forces.

4. Testing, Assessments, and Certification. As it is impractical to analyze the C4I interoperability as a single C4I entity, JITC employs a system assessment methodology with the end objective of assessing the capabilities of the system to function in the operational environment. As each C4I system is assessed and certified, the total picture of operational capabilities and weaknesses is better understood.

JITC addresses the joint C4I interoperability mission via a three-phased approach. The first phase is the standards conformance testing of C4I systems with the objective of assessing the degree of compatibility with the technical framework established by the appropriate JTA standards. The second phase is the interoperability testing of C4I systems with the objective of assessing the degree of interoperability among the C4I systems. The third phase is the verification of the interoperability certifications in the operational environment with the objective of assessing the degree of integration of the C4I systems within the joint operational networks.

Standards Conformance Testing. As a precursor to the joint interoperability test and assessment, information systems are required to undergo standards conformance test and assessment. The objective of this testing is to determine the system compliance to the appropriate standards described in the JTA with respect to electrical interfaces, messaging protocols, data formats, etc. For the standards compliance test and assessment, JITC prepares a letter of compliance with the applicable standards in the JTA.

Interoperability Testing. While standards conformance is an important and necessary step in all acquisitions, it is not sufficient to achieve full compatibility, integration, and interoperability. For the interoperability testing, JITC will prepare a test and assessment plan which outlines how the system will be tested against the requirements in the MNS and ORD, and how the system will be characterized with respect to the employment of that system in the joint operational

environment. Based upon the results of the test, JITC will prepare a letter of certification which describes the degree of integration and interoperability of that system within its intended operational environment.

Operational Verification of Interoperability Certifications. As previously discussed, JITC verifies the interoperability certifications through the field assessments of C4I systems during exercises and contingencies. This effort is a vital step in the interoperability process as JITC assesses the integration and interoperability of the C4I systems in the operational environment. Deviations and deficiencies are reported to the Joint Staff for the appropriate staff action.

Additionally, JITC documents the employment of C4I systems that deviate from the MNSs and ORDs of those systems. As previously discussed, this information is essential for the complete assessment of C4I interoperability. The deviations from the MNSs and ORDs are reported to the Joint Staff for consideration of additional requirement in the ORDs.

5. Scheduling and Funding of Interoperability Tests. JITC continually receives interoperability testing and certification requests. These requests are inserted into the Master Test Schedule; however, this does not guarantee funding for these projects. The tests and certifications are scheduled with a balance between the program manager s schedule, JITC s available test resources, organizational priorities, and functional priorities. Funding for standards conformance testing and interoperability testing are the responsibility of the program manager as part of his/her total test responsibility for the system acquisition in the pre-Milestone III phases. For post-Milestone III systems, JITC provides funding (as available) for interoperability testing and certification.

With respect to organizational prioritization, JITC assigns the top organizational priority for testing, assessing, and certifying interoperability to the joint C4I systems that support the warfighting CINC. The second organizational priority for testing, assessing, and certifying interoperability to the joint C4I systems that are acquired by the Services. The third organizational priority for testing, assessing, and certifying interoperability to the systems that are acquired by the Defense Agencies.

With respect to functional prioritization, JITC assigns the top functional priority to the tactical and strategic communications that support the warfighting CINCs and the National Command Authority (NCA). The second functional priority is assigned to the command and control

systems that support the warfighting CINCs. The third functional priority is assigned to the intelligence systems that support the warfighting CINCs. The fourth priority is assigned to the combat service support systems that support the warfighting CINCs.

6. Correction of Interoperability Deficiencies. JITC does not have the mission to enforce the correction of interoperability deficiencies. Our interoperability certifications are provided to the Joint Staff, the Director of Operational Test and Evaluation (DOT&E), the appropriate Service, and the appropriate Program Manager. It is the responsibility of the Services and Agencies to correct the joint interoperability deficiencies and shortfalls noted in the certifications. If possible, JITC provides a short-term work-around solution and a recommendation for corrective action. In follow-on certifications and field assessments, JITC tracks the corrective actions to the previously identified deficiencies and shortfalls. This information is provided to the Services and Joint Staff for consideration and action.

7. Interoperability Inhibitors. The below four factors inhibit the achievement of C4I interoperability. While no solution is available to completely remedy the problems, we are making every attempt to minimize the impact of these factors with respect to C4I compatibility, integration, and interoperability.

Emphasis on Service vice Joint Requirements. Because of decreasing resources (time and funding), the program managers are placing the greatest emphasis on Service requirements and the least emphasis on joint requirements. The end state is an increased number of fielded C4I systems which are not interoperable.

Complexity of the Joint Operational Environment. In recent years, the thirst for information has dramatically increased. As a means of quenching this thirst, C4I systems are being connected in a most complex and often unstructured fashion. The end state is that the fidelity and timeliness of the information is frequently unknown to the users of the information.

Fast Track Acquisitions. The recent efforts in streamlining acquisitions have resulted in quick injection of technology into the joint battlefield. The increased pressure on the program managers for rapid fielding has resulted in an increased emphasis on functional requirements and a decreased emphasis on compatibility, interoperability, and integration. The end state is an increased number of fielded C4I systems which are not interoperable.

Affordable Confidence. It is neither feasible nor cost effective to test all conceivable C4I navigational paths and system configurations. As a result, interoperability testing is focused on providing a reasonable and affordable confidence vice an absolute guarantee of interoperability.

B. Vision. The DoD C4I systems are the "glue" that binds the warfighters' sensors, command and control centers, and weapons platforms. As the lethality of our adversaries' weapons increases and the response time for neutralizing attacks on our warfighters decreases, our C4I systems must provide timely, accurate, and complete information throughout the various networks under all conditions of peace and battle. Our warfighters must have the complete information superiority to achieve battlespace dominance. Information superiority will be directly correlated to the degree of achieved C4I Interoperability in both the joint and combined arenas.

Newly acquired weapons platforms will be integrated into the battlespace via C4I systems. The integration of these weapons platforms will not be a trivial task given the large number of legacy systems that currently exist in battlespace, as well as other acquisitions from other Services that will also be integrated. C4I interoperability will be absolutely essential if the Department is to fully achieve the objectives outlined in JV 2010.

1. Communication Systems Interoperability. The Joint Task Forces (JTFs) of tomorrow must be agile and flexible. The various communications networks must be sufficiently robust and flexible to meet the operational requirements for JTF communications. The demands for rapid information transfer will increase with the increasing demand for near real-time voice, data, video, and imagery information. Given the expanding requirement for coalition warfare, the JTF communications networks must integrate the coalition communications networks with the existing theater communications infrastructure.

JITC s role in the communications arena is to certify that the various systems are sufficiently interoperable so as to provide a robust and seamless communications infrastructure for the JTF commander. The JITC certifications assure the warfighters that the systems are interoperable to the degree identified in the certification letters and test reports.

JITC will continue to test for interoperability of specific communications strings and network subsets with the objective of ensuring joint and combined interoperability. To accomplish these

objectives, JITC will expand the linkage into the test facilities of private industry as well as the test facilities of the Services.

JITC will continue to sponsor the annual JTF communications interoperability test in conjunction with operational CINC assets and Service testbed elements. The rapid insertion of new technology into the existing joint and combined infrastructure will increase the significance of this event given the primary focus of establishing a communications capability for the JTF.

Deployed Internetworking Test (DIT)

JITC has conducted the DIT on an annual basis for six years and has provided joint certification of new or improved versions of fielded tactical and strategic switching software and hardware. In previous years, JITC has opened its doors to the assessment of critical warfighting C4I systems nearing final development, giving the warfighter's communicator a vision into future battlefield capabilities as well as a valuable azimuth check for developers. Recently, JITC conducted the DIT98 which provided information to users showing to what extent switching systems and various information systems are interoperable over tactical cable, microwave, terrestrial, and Ground Mobile Forces (GMF) satellite connections. During the early planning stages of DIT98, CINCs, Services, and Agencies were solicited for candidate test systems and participation of their supporting communications units. Integration of operational units into DIT98's realistic joint scenario provides the Warfighter information that cannot be obtained in a single Service, lab environment.

Distributed Network Control Center (DNCC) and Strategic Switch Lab (SSL)

The DNCC's mission is to provide all circuit connectivity requirements between local testbeds and labs and all remote test facilities. DNCC personnel also provide technical assistance for equipment and network installation through site visits, telephone calls and email. The DNCC interfaces with off-site industrial labs, other military and government testbeds, and military units anywhere in the world.

The SSL's mission is to provide testing of the components (both hardware and software) of the Defense Switching Network (DSN) and the Defense Red Switch Network (DRSN).

JITC provides the manpower, equipment, circuit paths, and funding required to operate the JITC

distributed testbed network to conduct Joint and Combined Interoperability Certification Testing as defined by DoDD 4630 and MCM 117.

JITC supports the following customers: Defense Information Systems Agency (DISA), Army, Navy, Air Force, Marine Corps, NSA, Military Commanders-in-Chief (CINC'S), NATO, Allies, Defense Commissary Agency (DCA), and other DoD Agencies as well as commercial vendors as Northern Telecom, Siemens Corp, AT&T, Lucent Technologies, N.E.T., General Signal Technologies, Army Interoperability Network (AIN), and others.

Major components or equipment used to support this program include the following:

DNCC: Matrix Switch, Fiber and copper cable facilities, Leased DISN T-1 Circuit to Remote Test Facilities (RTF's), 740/745 Multiplexers, AIN T-1 Facilities with Multiplexers, IDNX Equipment, Timeplex Link 2 equipment, SL-1 Switch, various Encryption Devices (KG's, STUIII, etc), and assorted modems, DSU/CSU's, etc.

SSL: KNS-4100 Switch, MSL-100 Super Node Switch Enhanced, and Defense Red Switch Network equipment (Secure Portable Switch (SPS-1), Integrated Command Switch ICS-1, Digital Small Switch DSS-1, Remote Switching Unit (RSU-1)

Asynchronous Transfer Mode (ATM)

The Asynchronous Transfer Mode (ATM) is an exploding new technology in the communications arena and a transmission component segment of the Defense Information System Network (DISN). The JITC ATM testbed was set up in January 1998 and tested the degrees of interoperability of the DISN ATM ring to support DoD's Europe requirements. The testbed uncovered significant deficiencies, which would have been catastrophic in a joint operational network. In our partnership with industry we worked closely with the vendors and provided this type of information to them as we did with the ATM ring developer, FORE Systems. We worked together with them in our lab to demonstrate the faults so they could develop fixes and improve their product. We have many different pieces of equipment in our test beds and are able to configure most of the tactical networks found in the joint environment. Our testbeds are able to effectively simulate the European network by integrating the other DISN component testbeds here at JITC, such as the Defense Switched Network (DSN), Defense Red Switch Network (DRSN), Tactical Networks, and Transmission Systems, with the ATM testbed

and form a realistic environment in the lab. The developer is able to take corrective action during testing and save time in fielding their product. In cooperative agreement we publish technical papers stating the problems found in testing to the community of ATM product providers. This will minimize design changes prior to interoperability testing. The JITC ATM testbed ensures that these problems will not appear in the design of new products.

We are teaming with private industry to provide the "common sense" user's views and assist in the applications of ATM technologies for military communication requirements. The insertion of ATM technology into the communication infrastructure must be joint from the onset so the warfighter does not have interoperability problems as the equipment is fielded. We were able to repeat the test process used with FORE Systems to test a similar product designed by Northern Telecom therefore providing two possible solutions for DoD's European requirements. Future tests will take place with other ATM providers such as Lucent Technologies, Timeplex, 3 Comm and Cisco. The testbed continues to modernize its test tools to ensure that additional ATM programs and products are brought to the same level through a structured certification process. Our modernization also includes teaming with industry to the point where they are providing their vendor product to us and integrating them in our labs. Nortel and Fore have seen the value of our partnership and have installed over a million dollars of their equipment in our labs. We are forming a partnership with the Army's Technology Integration Center (TIC) at Fort Huachuca to avoid redundancy in testing of ATM products. They will look at protocols while we will look at the interoperability issues. The certification process will ensure a high level of interoperability in joint networks and assure the warfighter that an effective exchange of Command and Control information will be possible across strategic and tactical networks. The constant flow of ATM products through the testbed will ensure an up-to-date, technically proficient and experienced team of experts. These experts will then be available to provide the technical answers to the warfighter in the field during contingencies.

Electronic Key Management System (EKMS)

JITC is the lead developmental and operational tester for the Electronic Key Management System (EKMS). This partnership with the National Security Agency (NSA) developed years ago to conduct testing for NSA as their OTA. NSA is developing EKMS to replace the toms of COMSEC key they now distribute around the world with electronic key while maintaining the current high level of security. JITC initially focused on the problems found in the program to bring the program in line with user requirements that were not envisioned at program inception.

The program grew from a two man team to the current seven man test team. Today the Navy has fielded over 70 percent of their capability reducing the large volume of COMCEC key required to conduct daily operations. The Air Force and Army will begin fielding EKMS in 1998 and 1999. JITC will continue testing upgrades and modification to software and equipment prior to fielding

We formed a synergy in JITC by having the operators and engineers of this system close together leading to cost and time saving in all areas of the program. The first product did not take into consideration many of the service unique processes and equipment causing the program to review the requirements in mid development. The joint service expertise found in JITC's work force had made this program a success story. We will also be providing the help desk for EKMS this is a logical extension of our expertise in the program over the last years of testing.

Public Key Encryption

JITC is the DISA testbed for Public Key Encryption (PKI). We are working with the developer to test new technologies in the area of digital signatures, encryption, creation and storage. This new technology has application to many every day function in today's automated environment. Plans are to implement this technology in the Defense Travel Service and Voting over the Internet.

Defense Switched Network (DSN)

The Defense Switched Network (DSN) is the most used voice communications network in the DoD. DSN is the Joint voice communications component segment of the Defense Information System Network (DISN). The Multi-Level Precedence and Preemption (MLPP) feature is uniquely adapted to DoD requirements and ensures that in special and crisis situations designated users can communicate expediently. Even though it is primarily a strategic network, tactical networks interface to the DSN to achieve global reachback. DSN also supports video teleconferencing, data exchanges and facsimile transmissions through end user equipment adapters. The JITC DSN testbed was established to ensure Joint interoperability among DSN products. The testbed also provides DoD with an expert pool of technicians capable of handling DSN-unique military situations for the warfighter during special operations and contingency situations. Our folks are available to assist in providing on the job training to the users and answer calls from the field on our hotline to provide technical support. New products and

upgrades to existing products are tested in realistic simulated network environments to ensure a high level of confidence of interoperability and integration in the products for the Joint user.

Some time ago we realized that it would be cost prohibitive for DoD or a commercial enterprise to maintain a fully stocked testbed with all DSN products -- technology and requirement changes happen too fast and often. Thus, JITC has pursued partnership agreements with key DSN commercial product vendors, such as Northern Telecom, GTE, AT&T, and Lucent, for direct connectivity to their laboratories and testbeds. We mutually gain from each other during tests of enhancements, upgrades, new products, unique features and interfaces prior to their being introduced in the operational DSN. We understand the importance of coalition interoperability, so we work with European commercial switch companies such as Ericsson and Siemens. Their switches may be used by our allied and coalition partners in future operations. Therefore, it is critical to find early solutions to problems to enable us to maintain uninterrupted information superiority for the Warfighter. These methods improve interoperability and complement the dynamic changes in technology.

Defense Information System Network (DISN)

The Defense Information System Network (DISN) is the strategic telecommunications background that serves as the Defense Information Infrastructure (DII). JITC is heavily involved with the Program Management Office (PMO) in ensuring smooth cutovers to new service providers by assisting contractor testing and evaluating new services and functionality. This massive effort will ensure that an uninterrupted flow of reliable communications is available to the warfighter at the foxhole-to-National Command Authority level.

Defense Red Switch Network (DRSN)

The Defense Red Switch Network (DRSN) is the Command and Control secure voice network of choice by Commanders-in-Chief (CINCs). It's the joint secure voice component segment of the Defense Information System Network (DISN). Seven years ago this network was plagued with performance problems, unreliable call connectivity, and user frustration. In 1993 the Program Manager consolidated all DRSN efforts at JITC to obtain testing and performance efficiencies and to take advantage of economies of scale. We developed a synergistic effect by providing our expertise in Red Switches along with testing tactical to strategic connectivity with the multi-Service equipment we have available in our testbeds. Since then the JITC testbed made

tremendous strides in building DRSN program confidence for the developers and users. Today the testbed is used for developmental testing via dial-up from the network equipment developer, Raytheon E-Systems in Richardson Texas. We also use it for operational and interoperability testing. All Red Switch training is conducted in our facilities, maximizing the usage of this one-of-a-kind $12M facility. The ultimate result has been an increase in DRSN reliance by CINCs and Joint Task Force (JTF) Commanders in the field as the preferred secure voice communications network for Command and Control, and joint contingency support communications.

As a result of these partnerships the DRSN has not had any catastrophic failures over the last three years. This is directly attributed to the consolidation of all DRSN efforts in one testbed and the strong professional relationship that has fostered between the JITC and Raytheon E-Systems. These partnerships have ensured all DRSN hardware and software is tested in a realistic simulated network environment prior to fielding to the operational network. Partnerships of this nature also allow JITC early receipt of new releases of software and equipment, often at reduced or minimal cost. Industry leaders have realized that JITC is an impartial professional test organization, concerned (as industry leaders are) with providing the best solution to America's warfighters. This process provides a high level of confidence to users that enhancements and upgrade will be problem free. The training in our testbed encompasses all the Tri-Service operators of the DRSN. The training at the testbed serves two purposes. First, it provides the requisite training for the operators in all aspects of the network from end user equipment to switches and transmission. Second, and just as important, it provides the operators with the reassurance that there is a team of JITC expert technicians with the latest information that can provide them hot-line technical help on any situation. The JITC DRSN testbed will continue to be a great success for the CINCs, Services, and Agencies for reliable communications supporting all secure voice needs during all DoD operations.

Transmission Systems

The JITC supports the transmission component segment of DISN with two testbeds, the Ultra High Frequency Tactical Satellite (UHF TACSAT) testbed, and the High Frequency testbed. An additional testbed is in the initial set-up stages that will cover the exploding technology of TRIBAND satellite terminals, in particular for the Military Satellite Communications (MILSATCOM).

The UHF TACSAT testbed is the only testbed in DoD that can test for all three Military Standards (MIL STD) to provide validation of interoperability standards in support the Warfighter. We developed this capability to answer the Joint Staff's request to have all equipment tested for all three standards. We do this all in one location in a stand alone facility. Every piece of equipment must comply with MIL STDs 188-181, -182, and -183 and be certified by JITC for compliance before the Joint Staff will make channel assignment and they can begin operations.

A byproduct of the UHF TACSAT testbed is interoperability with Demand Assigned Multiple Access (DAMA) controllers for 5 and 25 kHz modes of operation. JITC has recommended to the Joint Staff to further mandate that all UHF DAMA terminals be tested separately for interoperability, after standards compliance and before fielding, to ensure each terminal has implemented all features and functions in the same manner. Our testbed has identified several instances of a terminal being compliant to the MIL STD, but unable to interoperate with another terminal because certain features/functions were implemented differently. We will recommend in our proposal that JITC validate the interpretation of the standards to prevent DoD from having multiple interpretations of the same standard.

The High Frequency (HF) testbed is unique in that it has the capability of spatially separated transmit and receive sites for interoperability testing. The testbed performs MIL STD 188-141A, -110A, and -148 compliance testing. This is the only test facility in DoD that has an operational capability along with testing and simulation capabilities. We work closely with industry and academia to assist vendors in developmental testing of leading edge technologies. As new technologies and protocols developed we participate in the developmental testing and follow through to the operational testing of these systems until fielded. We are participating in the technology insertion of Automatic Link Establishment (ALE) into the Army's new Nap of the Earth (NOE) radios in their helicopters. We routinely work with the HF community from the Department of Commerce in Boulder, Colorado to bring in the expertise from the National Telecommunication and Information Administration (NTIA). We complete the full partnership by bringing together people like Dr. Johnson, a leading expert in the HF field, from New Mexico State University and the developer to work out developmental issues. Our testing is well suited to test to military standards as well as federal or combined standards. We are serving as the OTA for testing the Special Mission Radio System (SMRS) for US Special Operations Command. JITC is beginning to test HF and UHF for a Norwegian fast patrol boat to military and NATO standard as part of a Foreign Military Sales case. This is the first step to support what we

anticipate to be further combined testing with other allied and coalition partners.

When the Air Force drew down its facilities in California the Scope Command program was consolidated here at Fort Huachuca, we are now providing those service at a reduces cost to the Air Force.

In the TRIBAND MILSATCOM arena, the JITC provides warfighter support using organic MILSATCOM assets as well as assets from other organizations. Triband terminals cover the X, Ku, and C bands of the Radio Frequency spectrum. We have supported the USAF, USA, and USSOCOM with interoperability testing of their Triband terminals in actual mission environments. We identified major deficiencies that were subsequently corrected, providing the Warfighter a more effective terminal for the Joint environment. Our plan is to acquire a TRIBAND terminal so we can directly connect our vast array of network and other transmission systems from other testbeds within the JITC to newly developed systems on location throughout the world. This will allow our testbed to extend a realistic environment during interoperability assessments of joint or combined systems.

Tactical Networks

CINCs and Services have the capability to set up tactical networks to support Joint Task Forces (JTFs) as they deploy in contingencies or crisis situations.

The JITC owns a number of systems that are used in deployed tactical networks. These are used to support voice, data, or message- type traffic key to successful deployments. The JITC has conducted a Deployed Internetworking Test (DIT) on an annual basis for several years and in this process has provided joint certification of new or improved versions of fielded tactical network systems. Testing emphasizes the following key areas for a successful deployed JTF: the ability of the JTF J6 to provide Joint Network System Management; ability of the JTF Commander to execute his C3 mission; and the ability to establish and sustain a Strategic to Tactical Entry Point (STEP) interface into the DISN to support reachback operations. DITs have included operational units to bring a more realistic flavor during testing. The JITC has used its capability to perform distributed testing by connecting units in locations throughout the US and in certain overseas locations such as the Pacific and Europe. Units have varied as follows: JCSE, Mac Dill AFB; 12th Air Force, Davis Monthan AFB; Marine Corps Tactical System Support Activity, Camp Pendleton, CA; SOCOM's 112th Signal Battalion, NC; and the USS Mount Whitney, Norfolk,

VA. The testing has also connected developer facilities at the Army's CECOM, Ft. Monmouth, NJ; and GTE, Inc., Taunton, NE.

Messaging and Information Systems

JITC's vision is to provide the assets, expertise and resources to ensure that Information Systems and Technology are tested, evaluated and certified to effectively support the Warfighter. Focusing on C4I systems in both a Service and Joint environment, JITC provides a means to test, evaluate and assess, both in laboratory and operational environments, C4I systems in order to determine system compatibility, interoperability, and integration. There are multiple areas where JITC will become an integral and vital partner in interoperability testing with the ASD (Health Affairs), the Navy, other Services, and Agencies. Through the Land Based System Integration Testing and Battle Group System Integration Test (BGSIT) evolutions, which simulate Battle Group C4I system configurations, afloat Joint Task Force (JTF) C4I systems can be tested and evaluated in a distributed network environment. With JITC's existing distributed test network and DISA's Technology Insertion Environment (TIE), there are numerous opportunities to validate architectural concepts/designs, support Advanced Concept Technology Demonstrations (ACTDs), determine engineering tradeoffs versus benefits and validate/test evolving Information Technology (IT) initiatives. These capabilities will also provide for implementation of rapid operational fixes to problems encountered by warfighters during normal operations, contingencies and exercises.

JITC has the lead for the interoperability certification of the Defense Improved Emergency Message Automatic Transmission System Replacement Command and Control Terminal (DIRECT). This system will ensure timely, accurate and dependable delivery of EAMs to the warfighter.

JITC has the lead for interoperability requirements review and testing the Joint Command and Control Ships JCC(X) ACAT I, Milestone 0 Program. This provides an embarked Joint Force Commander (JFC) and staff with enhanced mission capability for joint campaign battle management. It will employ the information superiority that results from advanced command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR). With JITC's extensive experience in Navy telecommunications testing, ashore/shipboard implementations, operational assessment support, and current lab assets that simulate both shore and fleet systems; many interoperability facets of this project will be immediately available for testing.

The Connectionless Messaging Transfer Protocol (CMTP), Global Broadcast System (GBS), and Communication System Network Interoperability (CSNI) projects support the realization of a connectionless multicast Defense Message System (DMS)-compliant message handling system for Joint and Combined environments. These projects will hasten the development of prototype and field-ready multicast messaging solutions. As the Interoperability Certification Agent for DoD, the JITC provides an environment that supports the test and evaluation of applications that utilize existing and future military broadcast systems.

JITC has existing partnerships with COMNAVCOMTELCOM and COMSPAWARSYSCOM for the test and evaluation of Navy/Marine Corps/Coast Guard messaging systems. JITC is also part of DISA's Technology Insertion Environment, primarily with Defense Message System (DMS) components, with connectivity through Ft Detrick, MD. JITC is also has partnerships with OPTEVFOR and OPTEC, AFOTEC to provide interoperability certification support during OT&E. This synergy provides timely test evolutions, cost effectiveness and operationally suitable and interoperable information systems to the warfighter.

JITC is forming partnerships with Navy test laboratories at SPAWAR Systems Center (SSC) Charleston, SSC San Diego, and the Navy Center for Tactical Systems Interoperability (NCTSI) San Diego. JITC's focus on these partnerships is to compliment and interconnect to these laboratories in order to conduct technology insertion evaluations, developmental testing, interoperability testing, battle group C4I simulations and Joint Task Force simulations. We will soon be investigating the Federated Battle Lab to identify how we can become a member and compliment their infrastructure and test/technology requirements.

JITC provides, operates, and maintains a DISA information systems certification facility at which all automated information systems (strategic and tactical), and other Service/Agency systems may be integrated, tested, operated, certified, and supported. The following is a brief description of the labs at JITC and new infrastructure requirements.

DMS Test Lab - DMS is an Official Organizational Messaging System for the U.S. Government. It is composed of two distinct sections, Messaging Services and Directory Services. Messaging Services is an official electronic messaging system that provides the users with e-mail that contains Message validate and non-repudiation. The Directory Services provides the users with a means of looking up official users and downloading their address. The Directory allows the customer to look up users by either an Organizational tree or by Location. The DMS

objective is to provide DMS access to all Official DMS users through out the government and allow AUTODIN closure.

JITC is responsible for all DMS Testing. We are involved in every phase of testing. We work with the integrating contractor to perform product level testing at Lockheed Martin. Then once the software is released to JITC we perform system level testing. The Developmental Testing (DT) team tests the system as a whole in a closed lab environment. After the software has passed DT, the Operational Testers take the software to selected operational sites and perform testing on the operational system. In addition, JITC also covers all performance and Y2K testing efforts.

Information System Test Lab (ISTL) - The ISTL is oriented towards Navy IT21 standards and is used for development and certification testing of new Navy telecommunications and information systems. The ISTL is part of DISA's Technology Insertion Environment Network.

DoD and its allies require a cost-effective, reliable, and interoperable means to support the direct broadcast of Defense Message System (DMS) messages across a connectionless multicast DMS compliant message handling system. This capability must support existing tactical and non-tactical propagation media, including SATCOM, HF, and landline.

Shore Messaging Simulation Deck - This lab contains a myriad of Service telecommunications systems, simulating communications stations. Development and certification testing is conducted on DMS transition and legacy systems. Upgraded PC components are needed to simulate various Automated Message Handling Systems (AMHS) which require integration into DMS and telecommunications architectures.

Fleet Messaging Deck - This lab simulates various shipboard communications systems, with the capability to monitor a live satellite network that is the primary ship-shore-ship telecommunications delivery method currently used by the Navy. Development and certification testing is conducted as well as feasibility tests. SIPRNET and SHF satellite connectivity is needed to simulate ship-shore-ship communications. Enhanced components such as Joint Maritime Command Information System (JMCIS) and Global Command and Control System-Maritime (GCCS-M) are required to conduct lab interoperability test and evaluations.

2. Command and Control Systems Interoperability. The JTF commander must deploy a myriad of sensors and weapons platforms to execute his mission. Command and Control (C2) of these assets continues to be a problem since many are not interoperable. This is an unacceptable situation for the goals portrayed in JV 2010, especially in the Theater Air and Missile Defense (TAMD) arena.

To achieve the objectives of JV 2010, C2 systems must provide an accurate, real-time picture of the battlespace. This will require a truly integrate network of sensors, C2 systems, and weapons platforms. As the decision process for firing solutions becomes increasingly more automated, the criticality of interoperable systems increases dramatically.

JITC will continue to conduct joint and combined C2 interoperability tests in conjunction with the facilities of private industry as well as the Service testbeds. We will continue to assess the TAMD environment during CINC exercises to identify emerging JTF requirements for C2 as well as capture C2 system deficiencies.

Joint Tactical Data Link (JTDL) Testbed

The JITC currently employs a distributed testbed for testing systems that interoperate via Tactical Digital Information Links. The test bed consists of a central test facility at Fort Huachuca with remote interfaces to BM/C3I systems scattered throughout the US. We have cooperative agreements with each of the services and NSA which collectively provides the necessary communications connectivity and test personnel to conduct TADIL testing.

The JTDL testbed provides the capability to perform joint and combined interoperability testing, evaluation, and certification of C4I systems operating tactical data links in a Joint Data Network (JDN). US and allied nation systems utilizing Tactical Digital Information Links (TADIL), US Message Text Formatting (USMTF), and Joint Variable Message Formatting (JVMF) are tested.

There is an increasing number of systems receiving and transmitting combat information over joint interfaces. Testing of US systems implementing the complex TADIL J link will increase from 6 in 1998 to 47 in 2005. In that same timeframe, USMTF testing will expand from 6 to 61. No systems have been tested for JVMF, but 49 have officially been identified for testing by 2005, with many more expected as the Navy converts from OTH to JVMF.

The customers and partnerships developed to support program JTDL are the Army, Navy, Marines, Air Force, NSA, Joint Staff, system developers, Director of Operational Test and Evaluation (DOT&E), Ballistic Missile Defense Organization (BMDO), Joint Theater Air and Missile Defense Organization (JTAMDO)

Global Command and Control System (GCCS)

The recent migration from the aging Worldwide Command and Control System (WWMCCS) to the technologically superior client/server-based Global Command and Control System (GCCS) would not have been so successful were it not for the joint OT&E coordinated and led by JITC. This system now provides interoperable, dynamic functionality for the planning and execution of the entire spectrum of conflict on a near real-time basis.

GCCS is intended to be the primary system for use with our allies and coalition partners. JITC is working with the Program Management Office (PMO) to address security and interoperability issues, and will evaluate the proposed solutions. As new technology allows this system to perform even more functions, the situational awareness of commanders will be further enhanced, allowing better operational decisions and thus shorter conflicts.

JITC's joint GCCS lab will become DoD's only Defense Information Infrastructure Common Operating Environment (DII COE) lab available to Service OTAs for testing, training and conducting Service OT&Es. This lab, built partly with funds from Office of the Secretary of Defense (OSD), will include the capability to evaluate functionality segments migrating to the Global Combat Support System (GCSS), discussed below.

3. Intelligence Systems Interoperability. Intelligence systems have a long history of so-called "stove pipe" systems. That is, intelligence systems, as an entity, have a very limited degree of interoperability. As a glaring example of the limited interoperability, JTF J2 and J3 shops found during the Gulf War that secondary imagery dissemination could only be accomplished by either a FAX transmission of the imagery or a courier. Since that time, the intelligence community has made concerted efforts to integrate their intelligence systems into the battlespace.

JITC will continue to work standards conformance and interoperability issues with Service

acquisition elements as well as commercial entities which provide commercial-off-the-shelf (COTS) solutions to intelligence voids. We will continue to integrate our C2 testbeds with the intelligence systems testbeds to ensure a seamless information transfer from the various intelligence systems to the C2 systems in the battlespace.

The Intelligence Community (IC) has developed unique systems throughout its years of existence. As the rest of DoD has become reliant on information to fight and win, the IC has embraced new technologies in order to provide the best information to the Warfighter on adversaries' capabilities and intentions just in time to support planning and operational needs. The IC now realizes that interoperability is the key to success on the modern battlefield and in support of developing diplomatic solutions.

In order to deter conflict and to fight and win the nation's wars if deterrence fails, the IC must break down the barriers to interoperability between the Services, Agencies, and our allies. The JITC directly supports this tenet through providing test and evaluation of intelligence systems both in standards development and interoperability certification.
While JITC is at the forefront of developing intelligence system interoperability programs, we have already realized considerable success in supporting the IC and thus the entire DoD. JITC has assisted the intelligence acquisition community in articulating intelligence interoperability requirements and examining the priority interfaces required to support the Warfighter. No other test organization provides the IC such assistance and perseverance in ensuring interoperability between Agency-developed systems and Service-developed systems.

JITC has only begun to break ground with the IC in providing interoperability support and testing support. This arena is critical to supporting operations at any level of conflict or in deterring conflict. Without the JITC, the IC has no way of truly determining if its systems will successfully interoperate in conflict

The JITC programs listed below support the Warfighter's needs for information dominance today and tomorrow.

National Imagery Transmission Format Standards (NITFS)

The National Imagery Transmission Format Standard (NITFS) is the designated standard for the formatting and exchange of digital imagery and imagery-related products between members of the

Intelligence Community (IC), the Department of Defense (DoD), and a number of other Departments and/or Agencies of the United States Government.

Although the NITFS was initially a suite of US military standards, it has now expanded into much broader application, both nationally and worldwide. The NITFS was adopted as an International Standard, ISO 12087-5, Basic Image Interchange Format (BIIF) in February 1998 and NATO nations are currently in the process of adopting it as a STANAG. Furthermore, the 42 nations subscribing to the Open Skies Treaty have agreed to exchange digital imagery using specific profiles of BIIF. In addition to international growth, non-DoD elements within the US (such as the Department of Commerce and the US Geological Survey) are expanding their NITFS implementations. This national and international proliferation of NITFS multiplies DoD's intelligence capabilities by facilitating interoperability with our combined partners and non-DoD imagery sources.

In the years 1990-94, the JITC conducted NITF version 1.1 compliance tests on 142 separate system configurations. For the years 1994-98, the JITC conducted NITF version 2.0 compliance tests on 163 system configurations. NITF version 2.1 became effective in October 1998. The expectation is that the number of tests for this newest iteration of NITFS and the other profiles of BIIF will easily exceed the past numbers of tests.

Not only is the number of systems increasing, but also the number and complexity of options and features in the standard have increased significantly to meet the growing requirement of imagery and geospatial data users. The format now supports monochrome imagery, true color imagery, pseudo-color imagery, false color imagery, synthetic aperture radar imagery, infrared imagery, multi-spectral imagery, and hyper-spectral imagery. A variety of internationally accepted compression algorithms are also supported for these imagery types. NITFS/BIIF also supports geospatial attribution data such as imagery and digital maps with latitude, longitude, and elevation data.

The JITC NITFS Test Facility continues to provide an ever-increasing level of support for the development of imagery related standards and compliance test services once the standards are adopted. As new standards are proposed, or modifications to existing standards are considered, the JITC provides test data to assist the standards developer in assessing impact of the changes on existing implementations. The compliance test services have proved invaluable in establishing commonality and interoperability among the implementations of NITFS.

The JITC NITFS Test Facility is constantly in a mode of modernization to keep abreast of current imagery computing innovations and improvements. Automated software test tools are continually being upgraded to keep pace with the fast pace of imagery, geospatial and compression standardization efforts. Personnel needed to support the test program have been on the increase since 1990. The effort started in 1990 with 3 testers and now averages 11-12 testers. The quantum increase of features and capabilities turned on for implementation of NITF version 2.1, compounded by the international and national proliferation of NITFS, will require approximately a doubling of personnel, test instrumentation, and lab space by 2005.

DoD Intelligence Information System (DoDIIS)

This program includes some 40 intelligence processing tools developed by DIA, NIMA, and the Services. They are intended to work together so that analysts at all levels can share needed information to answer Warfighter questions. The most notable intelligence systems in this program are the Modernized Integrated Database (MIDB) and Image Product Library (IPL). These systems must interface with all of the Service intelligence processing systems down to the tactical level. They additionally provide feeds to the GCCS at the collateral level. Successful interoperability is the key to successful exchange of intelligence.
A major part of ensuring information superiority is the DoDIIS interoperability testing program conducted by JITC. The DoDIIS testing program is an effort to ensure intelligence systems comply with the Assistant Secretary of Defense for Command, Control, Communications and Intelligence (ASDC3I) guidance to "bring Intel in line with the rest of the C4 community." This program has the full backing of the Director, DIA, who will not allow a system or mission application to be fielded until it has successfully completed joint interoperability certification by the JITC. In the past, systems were fielded that could not meet the IC's and Warfighter's total needs. This program fosters a much needed sense of cooperation between the Services and intelligence Agencies resulting in significant improvements in interoperability and improvements in fielded systems.

DoDIIS systems provide a vital link for intelligence flow between the National Intelligence Community and the Warfighters at the Unified Command and Joint Task Force level. The ability of DoDIIS systems to interoperate at all levels will provide the information superiority needed for successful joint operations.

DoDIIS systems are developed mostly by two ways: individually by the Services, or by DoD Agencies. Those developed individually by the Services fall below the Major System Acquisition Category and thus are not subject to the same level of pre-fielding testing and evaluation as major systems. Those developed by DoD Agencies are not subjected to a structured and rigorous testing. Often the only real independent testing many of these systems receive is during JITC's interoperability certification testing.

JITC has tested over 30 DoDIIS systems, including testing upgraded versions, since the testing program began. JITC testing has prevented numerous immature and faulty systems from being fielded (e.g., the Modernized Integrated Database, the Joint Collection Management Tools, and the Image Product Archive.)

Imagery Intelligence (IMINT)

JITC is an instrumental player in the Distributed Common Ground System (DCGS) program and particularly the Common Imagery Ground Surface System (CIGGS) program. JITC developed compliance levels for the CIGGS programs to enhance interoperability within the IMINT community. JITC is the only test agency that can bring together the Service test agencies and build consensus for developing systems and testing systems for Joint use. JITC developed the Test and Evaluation Master Plan for CIGSS which ties Service testing programs to joint interoperability testing programs and leverages off of every available test opportunity to provide a more cost effective paradigm for testing.

National Security Agency (NSA)

Recently, JITC began working with NSA to develop testing strategies in support of interoperability among NSA and Service developed Signals Intelligence (SIGINT) systems. These systems must interoperate in order to provide tip-off information to each other to support Warfighter needs. The NSA has not been successful to-date in achieving interoperability and oversight of all of the SIGINT systems in the DoD and has asked for JITC assistance. We are in the process of developing a Memorandum of Agreement with NSA to provide support to their interoperability testing requirements. The result will be better information reaching the Warfighter.

4. Combat Support Systems Interoperability.

JITC is involved in the test and certification of interoperability of health, logistics, personnel, medical, finance, procurement, and transportation systems. Too numerous to describe in detail, a few examples are listed below.

JITC is providing Compatibility, Interoperability and Integration (CII) certification support for the DoD medical community on systems such as Theatre Medical Information Program (TMIP), Medical Analysis Tool (MAT), Corporate Executive Information System (CEIS) and the Composite Health Care System II (CHCS II). Additionally, JITC provides CII certification support to the DoD logistics community on systems such as Fuels Automation System (FAS), Transportation Coordinators Automated Information Movement system (TC-AIMS), and Financial and Air Clearance Transportation System (FACTS).

Medical Systems Remote Test Lab

This lab will provide the capability to simulate shipboard and battlefield medical systems with the capability to access major health care systems via high speed landline, dial-in and satellite. High end PCs and SUN workstations are required to serve as platforms for the medical systems. High speed landline access and satellite link is required to provide access to the ASD (Health Affairs) test facilities.

Electronic Commerce (EC)

As part of the National Performance Review, the Federal government has a mandate to conduct business electronically, replacing paper transactions with electronic transmissions. Electronic commerce applies to all DoD functional areas, but current emphasis is on Contracting, Acquisition, Finance, Logistics, and Transportation. Electronic commerce encompasses the strategic and tactical combat support and combat service support arenas. The EC Vision is to provide DoD-wide world class EC services resulting in reduced operational costs and cycle times.

JITC tests and certifies interoperability among electronic commerce systems to include Y2K assessments. Our current emphasis is on upgrades to DISA and Defense Logistics Agency (DLA) systems for acquisition, contracting, and travel; and those under development to support

the transportation, logistics, finance, medical, and personnel functional areas. JITC provides all levels of testing for these integrated systems – oversight of development/unit testing, integration testing of individual components, system of systems testing, and operational testing.

JITC works directly with the DISA/DLA Joint Electronic Commerce Program Office (JECPO). Specific customers include the DISA developer and operators, the Defense MegaCenters (DMC), DLA, Defense Finance and Accounting Service (DFAS), and over 60 commercial vendors whose products, systems, and networks are tested for interoperability prior to fielding.

JITC currently employs a distributed test approach for electronic commerce. Our remote stimulation capability can provide ANSI X12 (EDI), User Defined File (UDF) or Web-based formatted transactions to any Internet Protocol (IP) address. This capability uses multiple SUN and NT platforms located at JITC, DMC-Ogden, DMC-Columbus, and the Defense Continuity of Operations and Test Facility (DCTF) at Slidell, Louisiana. DISA's EC Test Infrastructure includes the primary fielded electronic commerce components: Electronic Commerce Processing Node (ECPN), Central Contractor Registration (CCR) system, Electronic Document Access (EDA) system. These test systems are located at the DCTF in Slidell, Louisiana.

Summary. As the joint certifier of DoD C4I systems, JITC is uniquely placed and qualified to play an even larger role in supporting Joint Vision 2010's emphases. The JITC is ready to ensure that networks that carry the lifeline of the Warfighter are effectively tested. DISN and the tactical deployed networks are crucial to this lifeline, and JITC, as a Joint organization, is best placed to perform this task due to its experience, partnerships with other organizations, and adaptable processes.

5. CINC Support.

JITC has a core of field grade officers who maintain close relationship with each of the CINCs to respond to their communication needs. Among many things they coordinate technical assistance, testing requirements and exercise support with each one of those CINCs In the area of Interoperability Technical Support they link the warfighters back to our test beds and test departments to provide immediate solutions to them across the spectrum of Joint C4I Systems. The service is designed to enable commanders and technicians to ensure information superiority in Joint and Coalition operations. Expertise focuses on enabling information systems supporting

the Defense Information Infrastructure (from tactical to strategic operations)
To function effectively, tailored for theater requirements. This support includes:

C4I Network Planning	Voice/data Traffic Loading of Networks
Technical Engineering Assistance	Theater Air and Missile Defense Family of Systems Field Assessment
Data Analysis Assistance	Post exercise testing of systems and equipment strings
System and Operational Reporting	Post exercise Reporting
Field Assessment and Surveys	Test bed Support for Exercise Requirements

Contingency Support - JITC provides direct support to theater commanders Through requests from the CINCs and CJTF commanders to DISA and JITC. This support is designed to provide immediate solutions to theater Joint C4I interoperability problems. Support to contingencies includes interoperability planning and technical support to Joint C4I systems. This planning and technical support involves providing subject matter expertise, either by telephone or through deployed technical problem resolution support.

Contingencies Supported - JITC supported JUST CAUSE; DESERT SHIELD; DESERT STORM; PROVIDE COMFORT; Hurricane Iniki, Kauai Relief; Hurricane Andrew Homestead, Florida, Relief; Operation SOUTHERN WATCH; Operation RESTORE HOPE; Operation DENY FLIGHT; and Operation JOINT ENDEAVOR.

Exercise Assistance - JITC provides similar C4I technical support for Joint and Combined exercises. Based on requests by the US Commanders in Chiefs, JITC provides direct deployed support to selected Warfighter Exercises. All exercise participants can receive direct support for Joint/Combined C4I interoperability technical and planning issues from JITC via the Warfighter C4I Hotline.

Warfighter Exercise Support

Functional Support - JITC provides extensive interoperability functional support to the Warfighter during Joint/Combined exercises. This support is designed to alleviate planning and technical requirements not supported by theater planners when interfacing the strategic and tactical systems to the Defense Information Infrastructure. Field system assessments are conducted on a limited basis for C4I networks related to DII interfaces, GCCS and Theater Air and Missile Defense Networks operating within the DII supporting CJTF operations. Specific services include:

- Exercise support plan
- Enhanced Joint and Combined Interoperability
- Improved C4I Architectures
- Exercise reports and debriefs
- Improved documentation
- Identification of interoperability issues that may require further testing to provide the correct solution and documentation
- Lessons learned reports

Planning Support - Assists the customer in developing exercise objectives and is involved from the very beginning of the exercise planning process through attendance at Planning and Technical Control Conferences. Early involvement ensures the JITC staff can review diagrams and architectures, and recommend changes to help the customer's system networks and exercises run as smoothly as possible. This support is provided by deploying JITC personnel to the actual exercise locations (when required) and by off-site testing and evaluations at JITC's testing facilities.

Exercise Deployment - Throughout the exercise employment period, JITC personnel supporting Theater planners on C4I interoperability deficiencies work through the CJCCC or equivalent CJTF J6 element. Data collection efforts for field assessments are also coordinated through the CJTF J6 element to meet the CINCs assessment requirements. As an exercise "trusted agent," only the customer receives the report; no other organizations are provided this information without the customer's express approval. This report focuses on C4I system functionality and emphasizes operational impacts to the Warfighter in their analysis, conclusions, and recommendations.

Warfighter C4I Lessons Learned Report - The Warfighter C4I Lessons Learned Report is a quarterly technical document addressing C4I interoperability problems/issues related to Joint/Combined C4I and Integration of information systems within the Defense Information Infrastructure. It is designed to provide the user in the field with information and solutions not readily available through conventional sources such as technical manuals, technical orders, and other official documentation. It provides relevant and timely information to planners, operators, and maintainers of tactical and strategic command, control, and communications equipment and systems. Sources of the document include, but are not limited to, Joint/Combined exercises, JCS Manual 6231 series, interoperability testing and certification, contingency and relief operations, and input from planners, operators, and maintainers of tactical and strategic C4I systems and equipment. The document is distributed to any requesting CINC, DoD Agency, and the Army, Navy, Air Force, Marines, Coast Guard, National Guard, and Reserves, and their contractors upon request. Currently, over 1300 organizations are on distribution for over 1800 copies of the report. This report is available worldwide via the Joint Interoperability Tool Web Site to military organizations.

Combined Interoperability Program - The JITC assists the Warfighter in Combined C4I interoperability enhancements. The JITC provides C4I interoperability support to the Warfighter before, during, and after contingencies and exercises in the Combined environment. The JITC assists in global standardization of Combined forces while knowledge of interoperability of systems is gained and documented, as the Warfighter sets priorities. The JITC is a trusted agent to the Warfighter and, as such, does not disclose any information on the support provided except to that Warfighter. The JITC can provide on-site testing in non-hostile environments, in addition to testing systems at our testbed. The JITC can provide expertise in the global Theater Air and Missile defense networks, all major tactical switch networks, and computer system standardization in support of the Defense Information Infrastructure, GCCS, and the Warfighter's Joint mission accomplishment. The following technical support can be provided via subject matter experts:

- C4I network planning
- Technical engineering/assistance
- Data analysis
- Systems pre-testing
- Objectives development

C. Required Infrastructure.

JITC's infrastructure consists of approximately 20 different test labs in three facilities located at Ft. Huachuca, AZ, Cheltenham, MD, and Virginia Square in the NCR. This infrastructure is truly a joint asset, providing test and evaluation services to a broad customer base comprised of DoD, CINCs, Services and Agencies; other Federal agencies; and commercial vendors. Approximately 250 military and DoD civilian personnel and 450 contract employees provide the technical expertise required to support testing and test support activities.

Infrastructure is comprised of three primary categories: testbeds, test tools and overhead.

Details of JITC's test labs, and their contribution to JITC's vision, have been provided above. As DoD experiences growth in acquisition, expected by the Defense Science Board (DSB) to be about 50 percent above current levels, JITC expects its testing workload to also increase. It is unrealistic, however, to expect infrastructure to increase commensurately. Therefore, JITC will increase its partnering with the CINCs, Services, and commercial entities to accommodate significant portions of this growth. This will not be difficult since JITC has already established this practice with success. Elimination of dedicated funding for modernization in FY95 created the impetus for JITC to augment its facilities by seeking sources other than its own test labs for test conduct. For example, through the distributed network controller and its remote test facilities, JITC is able to interface with off-site industrial labs, other military and government testbeds, and military units worldwide. The network integration testbed allows JITC to extend networking capabilities to tactical forces to provide interoperability testing. As an alternative to outright purchase, JITC enters into equipment loan agreements with the CINCS, Services, and commercial entities for use of equipment during testing. A major example of this is the aforementioned annual Deployed Internetworking Test (DIT) where tactical systems are tested and certified for interface with strategic systems. The CINCs, Services, and commercial entities provide the equipment and operators while JITC funds per diem, travel and shipping costs. Frequently, JITC enters into agreements with its customers to exchange services for needed equipment. An example is the establishment of the Electronic Key Management System (EKMS) test lab, which was funded by the National Security Agency. Another example involved partnership with a consortium of commercial and academic customers to establish an Asynchronous Transfer Mode (ATM) test lab.

JITC also seeks other ways to expand the joint use of testbeds. One success story is the use of

the Red Switch for both testing and training. At least twice a year, students from the various Services receive Red Switch training on a cost reimbursable basis using JITC systems and facilities. Testbeds are also used to replicate and resolve problems encountered by the CINCs and Services during routine and contingency operations. A major success story is JITC's support of the Bosnia contingency. Personnel in theater transmitted interoperability problems back to JITC. These problems were replicated in the testbeds and solutions devised for transmittal back to theater.

The following JITC tools support our infrastructure:

INTELpro Intelligence Interoperability Analysis Tool

The Commanders-in-Chief (CINCS) require a tool to assess the interoperability status of the intelligence systems within their theater of operations. This analysis tool graphically portrays the joint intelligence architecture within their command at the Strategic, Operational - Joint Task Force (JTF) and Tactical level. The tool portrays the current certification status of all joint and Service/agency intelligence systems. In addition, the tool provides the capability for the Warfighter to determine potential interoperability problems within a proposed JTF before deployment, and displays system interfaces from the Combatant Command down to the system level. The tool is a web-based resource and is capable of interactive use by the entire intelligence community, the CINCS, the JTF command structures and their staffs. The tool is designed to be accessible on the SIPRNet and serve as a repository for intelligence architecture, references, system documentation, and current interoperability certification status. The tool is tailorable in order to address the CINCS individual needs, and should initially be populated with data from the Pacific Command (PACOM), Atlantic Command (ACOM), Central Command (CENTCOM), and the National Intelligence Agencies.

JITC developed the INTELpro Interoperability Analysis Tool to address the needs of the Warfighter and the intelligence community. Currently, the emphasis is on gathering and loading of architectural and system information into the database. The INTELpro will be accessible by authorized users on a subscription basis. The INTELpro allows authorized users to examine the Joint Intelligence Architectures at the Strategic, Operational (JTF), and Tactical levels. JITC will continue to enhance the tool's capabilities. The INTELpro can currently provide the User a snapshot of the intelligence systems under their control that require interoperability certification.

JITC recently briefed INTELpro to several representatives from the National Security Agency (NSA). They supported the tool's concept and made several laudatory comments regarding the current state of development.

Software components are the INTELpro Database (SQL Server), Web Server, and Cold Fusion Enterprise Web Application Development Tool. The hardware components necessary are the Database Server and Web Server.

InterPRO Interoperability Analysis Tool

InterPRO is an Internet-based joint interoperability analysis support tool developed by the Joint Theater Air and Missile Defense Organization (JTAMDO) that permits analysts and warfighters to analyze the detailed facts that comprise the operational, system and technical Command, Control, Communications, Computers and Intelligence (C4I) architecture.

An agreement between JTAMDO, the Ballistic Missile Defense Organization (BMDO), and JITC will allow JITC to continue the development and maintenance of interPRO.

The interPRO analyzes the requirements necessary for inter-system/inter-Service compatibility and interoperability, and provides the capability to retrieve fact-based descriptions of the systems by using Service data available on-line.

The interPRO assists warfighters in identifying and prioritizing which systems need to be certified. It provides them a tool which can portray the current theater interfaces and interoperability issues. These analyses can be used prior to and during demonstrations, exercises, and wargames.

Joint Operational C4I Assessment Tool (JOCAT)

The JOCAT is a world-wide deployable system, which was developed to support the interoperability assessments of field exercises and real world contingencies for the full spectrum of Joint Theater Air and Missile Defense (JTAMD). The JOCAT monitors the Joint Data Network (JDN), selected voice networks, Tactical Information Broadcast Service (TIBS), TDDS data networks, the Joint Planning Network (JPN), and exercise Distributed Interactive Simulation (DIS) networks. The JOCAT provides operational analysis during real-time, near real-time, and post exercise.

JITC Interoperability Tool (JIT)

The JITC Joint Interoperability Tool (JIT) provides high-speed access to key interoperability information over the Internet. The heart of the system is an extensive data repository featuring the JITC Lessons Learned Reports, JITC test reports and the NATO Interface Guide, Joint Interoperability certification letters and other interoperability documents and references. It has a high speed search engine to quickly access data allowing you to search on key words or concepts. This tool gives a quick and easy on-line capability, which identifies system/equipment characteristics, tested configurations and practical "how-to" information to facilitate interoperability.

Another component of JITC's infrastructure is the overhead, which includes items such as facilities, logistics, base operating support, and testbed operations and maintenance. In FY96, JITC's overhead costs were less than 20 percent of total obligation authority of approximately $60M. This was accomplished through a series of efficiency measures implemented to deal with dwindling institutional funds and increasing customer orders. Prior to FY96, functions associated with operation and maintenance of the Joint Test Facility were organizationally split. By combining these functions into a single task, JITC was able to ensure cross-training of personnel in both operations and maintenance, and cross-leveling of work assignments to qualified personnel. Also prior to FY96, each department within JITC was responsible for acquiring hardware and software maintenance and licenses for departmental systems. Through centralization of the function into one department, contracts were consolidated, leading to economies of scale and maintenance/licensing discounts. Another consolidation effort involved a variety of support functions, i.e., configuration management, logistics, facilities, reproduction, library and visitor support, which resulted in cost savings as well as improved management

control over the functions. Since FY96, JITC has succeeded in stabilizing overhead costs while continuing to support an ever increasing and complex test mission.

JITC's marketing efforts have helped offset some of the overhead costs. As JITC's customer workload increases, we are able to spread some of those costs to a broader and diversified customer base. As a result of marketing efforts, reimbursable orders have increased from approximately $20M in FY94 to over $40M in FY98. Yet, JITC's rates remain reasonable and competitive.

Base operations support (BOS) is provided by the Department of Army, through a host/tenant support agreement, for purchasing and contracting services, utilities, military and civilian personnel administration and equipment calibration, maintenance and repair. In FY96, BOS was approximately 3 percent of total obligation authority of $60M.

In the early years of JITC's existence, we embarked upon a philosophy that reserved scarce government manpower resources for providing technical oversight of an expanded contract workforce. JITC's ratio of government to contractor is approximately 1 to 2. Our contract instrument, which is cost plus award fee, enables us to expand or reduce the contract workforce to meet the requirements of the test mission. The only functions that JITC has not contracted are those considered to be inherently government, e.g., technical contract management, budget, manpower, etc.

To further restrain infrastructure costs, JITC utilizes modeling and simulation where it makes sense to do so. For example, in the Tactical Data Link (TADIL) arena, an aircraft is introduced into the link and its flight simulated. This reduces operational flight costs to the customer while providing a real test of the system. The satellite simulator is used during Shore-to-Ship-to-Shore testing of Navy messaging systems, reducing need operational satellite assets. The Circuit Switch Traffic Simulation System/Message Switch Traffic Simulation System stress-tests networked switches by injecting massive quantities of messages. Using the Volume Automated Test System, protocols are simulated during developmental and operational testing of the Defense Message System.

We at JITC believe we are at the forefront within DoD when it comes to introducing innovation and efficiencies into test conduct. Our attention to cost reduction measures, partnership with other Services and commercial parties, innovative contract practices, and use of simulation

indicate a continuing effort to provide the best service to DoD and our other customers at a competitive price. We will continue our efforts to link testing and training in order to reduce costs and support an operationally realistic testing and training environment. We will continue to explore use of technology and Modeling and Simulation to reduce costs. And, finally, we will continue to focus on total system assessments using data from all available sources rather than rigid testing.

Section 2. Operational Test and Evaluation.

Background. The JITC is one of five designated Operational Test Agencies (OTAs) in the Department of Defense (DoD). Each of the Services has one and JITC is DISA's. JITC is the only joint OTA in DoD. As DISA's OTA, JITC performs Operational Test and Evaluation (OT&E) on DISA-acquired or managed systems. The purpose of OT&E is to determine that these systems meet the users' requirements. To make this determination, production systems are evaluated in their true operational environment using real users as operators. Thus, it is significantly different than development testing conducted in a laboratory environment with technicians and/or development contractors.

Other DoD Agencies which have acquisition authority are required by Title 10 of the U.S. Code to conduct OT&E on qualifying systems. Rather than establish the infrastructure to conduct such testing themselves, they outsource to one of the existing OTAs. In this capacity, JITC is serving as the OTA for the Defense Commissary Agency (DeCA), the Defense Logistics Agency (DLA), the Defense Finance and Accounting Service (DFAS), and in partnership with Service OTAs for the Ballistic Missile Defense Organization (BMDO). JITC also serves as the OTA for various Commander-in-Chief (CINC) tests and as the Responsible Test Organization (RTO) for a variety of Service and Agency programs.

Support of Joint Vision 2010

Command and Control. A key tenet of Joint Vision 2010 is to deter conflict, and if that fails, to fight and win the nation's wars through a strategic nuclear deterrent and power projection. JITC directly contributes to this goal by its efforts to ensure the global command and control systems work effectively for the warfighters. The recent migration from the aging Worldwide Command and Control System (WWMCCS) to the technologically superior client/server-based Global Command and Control System (GCCS) would not have been so successful were it not for the joint OT&E coordinated and led by JITC. This system now provides interoperable, dynamic functionality for the planning and execution of the entire spectrum of conflict on a near real-time basis.

GCCS is intended to be the primary system for use with our allies and coalition partners. JITC is working with the Program Management Office (PMO) to address security and interoperability issues, and will evaluate the proposed solutions. As new technology allows this system to

perform even more functions, the situational awareness of commanders will be further enhanced, allowing better operational decisions and thus shorter conflicts.

JITC's joint GCCS lab will become DoD's only Defense Information Infrastructure Common Operating Environment (DII COE) lab available to Service OTAs for testing, training and conducting Service OT&Es. This lab, built partly with funds from Office of the Secretary of Defense (OSD), will include the capability to evaluate functionality segments migrating to the Global Combat Support System (GCSS), discussed below.

The Defense Message System (DMS) is intended to replace the slow, obsolete Automated Digital Network (AUTODIN). DMS will provide writer to reader secure messaging and allow transmissions of attachments in numerous media, e.g., imagery, voice, and data. This is a quantum improvement over previous systems. Once again, JITC is leading the joint partnership of OTAs to ensure the DMS meets the users' requirements before AUTODIN is shut down. The importance of highly reliable, secure communications to the information superiority of our forces is obvious. JITC will ensure the system is ready from the joint user's perspective prior to a fielding decision.

The Defense Information System Network (DISN) is the strategic telecommunications background that serves as the Defense Information Infrastructure (DII). JITC is heavily involved with the PMO in ensuring smooth cutovers to new service providers by assisting contractor testing and evaluating new services and functionality. This massive effort will ensure that an uninterrupted flow of reliable communications is available to the warfighter at the foxhole-to-National Command Authority level.

Focused Logistics. Another important aspect of Joint Vision 2010 is focused logistics, whereby the combination of information, logistics, and transportation allow our forces to be more mobile, versatile and protectable. As DLA's and DFAS's OTA, JITC is directly involved in making these goals attainable, supporting the *Focused Logistics Roadmap*. The logistics systems developed by DLA procure and provide the necessary materiel, provide total asset visibility, and ensure they are rapidly distributed to sustain combat. DFAS's systems ensure that materiel is properly contracted and paid for, as well as providing confidence to the warfighter that his or her pay and allowances are properly processed in their absence. JITC ensures that these systems perform as expected in the operational environment.

The Scheduling and Movement (S&M) functionality within GCCS provides planners the capability to immediately visualize airlift and sealift conflicts, develop contingency plans and adjust those plans in execution. JITC ensured that this capability was both adequate and accurate. Other functions, such as the Global Transportation Network (GTN), within GCCS perform similar tasks for logistics and transportation. As previously mentioned, the DISA-developed GCSS includes other logistics capabilities that will also be evaluated by JITC.

Training and Readiness. A key function of OT&E is to determine whether the intended users of a system are properly trained to operate that system. JITC takes great pains to ensure that human factors issues are addressed in OT&E, that systems are safe to operate, and that an adequate life-cycle logistical/maintenance support plan is in place. As new system increments are delivered, JITC reevaluates them to be sure that no previous capability was lost and that new capability meets the users' requirements. Any deficiencies are fed back into the learning loop for correction. JITC's GCCS lab is used extensively by other Service OTAs for training and test preparation.

Information Warfare. Information is a resource. As such, it must be protected not only from the enemy, but from those who would tamper with it, if only for sport. Security issues are an important area of measurement in any OT&E conducted by JITC. Deficiencies are reported and followed-up in subsequent evaluations to ensure corrective actions have been accomplished.

JITC is a member of a joint working group with the other OTAs to design plans to evaluate vulnerabilities of systems early in their life-cycle so that they do not reach the field in an unsecure mode. The rapid pace of technology, the increasing sophistication of hackers, and the ubiquity of computer-based systems makes this a formidable task.

Modeling and Simulation. JITC is currently collaborating with several Naval Postgraduate School (NPS) departments about numerous joint OT&E and modeling and simulation (M&S) efforts in support of the Joint Staff and the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence (ASD(C3I)). Pillar DoD Command, Control, Communications, Computers, and Intelligence (C4I) systems, such as GCCS, DMS, GCSS, DISN and the DII COE, are the primary targeted programs. JITC will be working with NPS students and key faculty members in FYs 99 and 00 to design, build, test and validate the only joint C4I M&S project in DoD. This capability, known as the Joint OT&E Simulation Environment Facility (JOSEF) and funded by the OSD Central Test and Evaluation Investment

Program (CTEIP), will assist in the evaluation of core operational effectiveness measures of performance.

Summary. As the *only* joint OTA, JITC is uniquely placed and qualified to play an even larger role in supporting Joint Vision 2010's emphases. JITC's OT&E involvement in major joint C4I programs--those developed by DISA, DLA, DFAS, and soon BMDO--mandate that additional, not reduced resources be available. As acquisition reform initiatives such as Advanced Concept Technology Demonstrations (ACTDs) put more systems in the field with minimal program management, it is imperative that a dynamic, flexible approach be taken to protect user requirements. A joint organization, like JITC, is best placed to perform this task due to its experience, partnerships with other organizations, and adaptable processes.

Section 3. Summary.

JITC has a long history of partnering with CINCs, Services, and commercial entities to accomplish the very complex and very broad mission of joint interoperability testing and certification. We envision a significant growth in the C4I arena given the exploding technological advances and the rapid acquisitions. JITC will continue to seek additional partnering opportunities to minimize the infrastructure cost of providing joint interoperability testing. We will continue to focus on the joint and combined aspects of C4I interoperability to ensure that DoD achieves information superiority and the objectives of JV 2010.

JITC has established a sound C4I interoperability program which addresses the full life-cycle of C4I acquisitions. The recent changes in acquisition methodologies have produced negative side effects which JITC is attempting to address. The end objective of the C4I interoperability program is to achieve the highest degree of compatibility, integration, and interoperability. We need to work hand-in-glove with the various acquisition and operational elements to ensure that the warfighters have full knowledge and confidence in the C4I systems that they take to war. We do not want the battleground of tomorrow to become the testing ground for C4I acquisitions.

April 6, 1999

TF

MEMORANDUM FOR DIRECTOR, DEFENSE RESEARCH AND ENGINEERING
(ATTN: DR. LANCE DAVIS, DR. PATRICIA SANDERS)

SUBJECT: Section 912(c) Defense Agency Plans

The Ballistic Missile Defense Organization (BMDO), the Joint National Test Facility's (JNTF) parent organization, is responsible for managing, directing, and executing a Joint Mission Area Acquisition program for missile defense. The BMDO Strategic Plan, September 1, 1998, defines three dimensions to the mission. One of the dimensions is: "Ensure interoperability of those systems among our forces and those of our allies." The JNTF is unique among all the DoD Research, Development, Test, and Evaluation (RDT&E) organizations. It is the only organization capable of supporting BMDO's Joint Mission Area Acquisition by testing, evaluating, and verifying the interoperability of missile defense systems.

The threat to the U.S and its allies from ballistic and cruise missiles is real and growing. It is imperative that BMDO be able to field missile defense systems to counter these threats. Current examples of these threats include the recent ballistic missile launches by North Korea and Iran, the nuclear tests in India and Pakistan, and the growing proliferation of low-cost cruise and ballistic missiles. More than 20 countries possess or are developing weapons of mass destruction.

The Clinton Administration has implemented a strategy to meet the growing threat. The strategy has two thrusts. First is to provide a National Missile Defense to protect the U.S. from limited ICBM attack by a rouge nation or an accidental launch. Second is to provide a theater missile defense to protect forward-deployed forces, allies, and designated critical assets.

The need for interoperability is an overarching, critical requirement for missile defense. For example, the theater missile threat is so complex no one defensive system can meet all requirements. BMDO envisions a layered defensive system

composed of several complementary capabilities. This Family of Systems (FoS) is a fully integrated assemblage of current and future multiple weapon systems, sensor systems, and command and control systems. To work effectively, the FoS must be fully interoperable - capable of sharing and acting upon a common view of the battlespace, identifying objects within the battlespace, and controlling the battle.

The JNTF is specifically designated to provide BMDO with an unbiased modeling, simulation, and test center to focus on the inter-service interoperability and integration aspects of the missile defense systems acquisition (Attachment 1, JNTF Charter). The JNTF enables BMDO to present a level-playing field for resolution of missile defense issues, which cut across Service lines. Their role will become increasingly important and will be expanded to ensure interoperability is achieved within the FoS. The JNTF has alliances and works closely with a number of organizations to achieve its Joint and Combined acquisition missions (Attachment 2).

Congress recently allocated $1B specifically for missile defense in the FY99 Supplemental (DoD) Appropriation Bill. The sense of the Congress reflects the Report of the Rumsfeld Commission. The threat is real - now, and we must prepare - now. The JNTF is vital to that preparation.

The JNTF has received the following guidance regarding its missile defense roles and responsibilities:

> *"...BMDO will translate the JTAMDO developed operational architecture into systems architectures, perform systems engineering...plan and ensure integrated testing of defense architectures."*
>
> Gen Ralston - Dr. Kaminski Letter, Nov 96

> *"...we will expand role of the JNTF in the area of analysis of technical aspects of operational and systems architectures..."*
>
> LtGen Lyles' Memo to Admiral Gehman, Jan 99

> *"I will impose exit criteria on all of our programs and mandate that they be evaluated by the JNTF in regard to interoperability at all key milestones..."*
>
> LtGen Lyles' Comments on Exit Criteria, Jun 97

The JNTF Technical Advisory Panel (Attachment 3 for members) in October 1998 recommended the following:

Interoperability:

Support Joint C2 System Algorithms and Rules of Engagement Assessments
Assist USACOM in Developing TAMD Concepts
Modeling & Simulation (M&S)

Expand M&S Efforts:

Campaign Analysis
Test and Evaluation of Exit Criteria

Testing & Evaluation (T&E)

Unique Joint Perspective

Examples of JNTF capabilities supporting the joint and combined acquisition mission include:

Command Control (C^2) Simulations which will enable warfighters and acquisition professionals to analyze and evaluate future joint missile defense Concepts of Operations (CONOPS), architectures, and interoperability in both the TAMD and NMD domains. A new, advanced Simulation (Wargame 2000) will be used for C2SIM99 wargame. C2SIM99 will address the NMD JPO's development using the NMD BMC^3 system and USSPACECOM's Concept of Operations.

The Battle Management/Command, Control, Communications, Computers, and Intelligence (BMC^4I) laboratory will enable current (deployed) systems and command centers to interface with models and/or prototypes (hardware) of future systems. Linking these systems will enable the investigation and evaluation of their interoperability and effectiveness to meet the ultimate goals of verifying and validating the interoperability of joint and combined missile defense systems.

The Theater Missile Defense Exerciser (TMDSE) is a Hardware-in-the-Loop test capability that enables assessment of TMD FoS operational performance using the tactical hardware and software.

The JNTF is also the Ballistic Missile Defense Joint Technical Architecture (JTA) Compliance Engineer, responsible for coordinating and implementing JTA standards across BMD

programs, performing compliance-engineering evaluations, tracking JTA implementation progress and issues, and supporting OASD (C3I) JTA implementation throughout the U.S. military.

The JNTF was assigned by Lieutenant General Lyles to be the BMDO Year 2000 (Y2K) Test Agency. The JNTF has responsibility to "identify potential Y2K interoperability problems in Missile Defense" and to "lead the BMDO Y2K interoperability testing of National Missile Defense (NMD), Theater and Air Missile Defense (TAMD), and selected BMDO Science and Engineering (SE) systems."

Recently the JNTF was selected by the (OSD) High Performance Computing Management Office (HPCMO) to receive funding to advance the state-of-the-art for advanced wargaming to enhance the realism and completeness of the synthetic battle space.

The following paragraphs address the bulleted topic in the referenced memorandum.

- **Savings within each taxonomy area (Cost Based Management Tool (CBMT)).**

The funding reductions identified in the POM do not reflect requirements and do not reflect (recent and ongoing) revised requirements for increasing the use of the JNTF. See next paragraph.

- **Portion of these savings already included in the POM.**

BMDO funding for the JNTF as reflected in the Current Program Status (CPS) is as follows (does not include military pay or Service MIPRs) in millions of dollars:

FY96	FY97	FY98	FY99	FY00	FY01	FY02	FY03	FY04	FY05
65.375	78.249	84.103	77.659	77.353	69.645	73.080	69.397	70.324	71.907

In addition to BMDO funding, Air Force Space Command and other Service organizations, which occupy about 40% of the JNTF operational space, spend $20M per year on Service technical projects. Further, about $2M per year of military pay, including benefits, may be attributed to the JNTF.

After peaking in FY98 at about $84M, the CPS currently reflects a 14.5% reduction across the FYDP - to about $72M by

2005. $2M was saved in FY00 and $4.4M in FY01 by consolidating the JNTF R&D and O&M contracts. Additional measures to reduce costs include 18% reduction in the National Test Facility Advisory and Assistance Services (NAAS) contract in FY99.

Service requirements are provided only on a year-by-year basis and cannot be accurately projected in the out-years except to project the continuing current level of about $20M.

- **Portion of savings are infrastructure dollars versus program dollars.**

Attachment 4 indicates that the proportion of total resources spent on infrastructure has been declining while the proportion of mission (RDT&E) spending has been increasing. The proportion of resources allocated to direct mission activities is projected to be even larger in the future.

- **Portion of personnel savings will be bought back by A-76 contract actions or other means.**

A-76 does not apply. JNTF is a Government Owned, Contractor Operated facility. Government military and civilian personnel comprise only 10% of the total JNTF personnel (not including personnel of Service organizations tenant in the JNTF). The CBMT submission for FY96 showed 15 military, 51 civilians, and 599 contractor work-years.

- **Processes invoked to achieve streamlining (business process reengineering, privatization in place, etc.).**

JNTF has streamlined in FY99 and for the out-years:

- Reduced JNTF overhead while preserving the accomplishment of missions and functions.
- Reduced the NAAS contracts by 18% in FY99, and that could be carried out through the FYDP.
- JNTF is expanding use of the IMPAC card to reduce logistics overhead, expedite procurement, and simplify accounting.
- Contracting and other functions have implemented the Standard Procurement System as reengineered business process.
- Reorganized the Government staff to better focus on the mission. This is a new initiative begun in February 1999 and will be completed by the end of the FY.

Conclusion: The JNTF is essential to enable the Administration to develop, acquire, and field JOINT missile defense systems. The JNTF is continually focusing resources to satisfy these joint and combined missions while ensuring those resources are used efficiently and effectively.

//S//

R. D. WEST
Rear Admiral, USN
Deputy Director

Attachment 1

THE JOINT NATIONAL TEST FACILITY (JNTF) CHARTER

A. PURPOSE

This charter describes the vision and general concepts of the Ballistic Missile Defense Organization's (BMDO) Joint National Test Facility (JNTF).

B. MISSION

Provide missile defense related analysis, system level engineering, integration, and test and evaluation support for the development, acquisition and deployment of missile defense systems and architectures. Support the development of joint and combined missile defense doctrine, requirements, and concept of operations (CONOPS). Support combatant commands by integrating missile defense concepts, space asset exploitation, battle management/command, control, communications, computers, and intelligence (BM/C^{4}I) and by conducting joint and combined simulations, wargames and participating in exercises as directed.

C. GENERAL CONCEPTS

As tasked, the JNTF will:

1. Support missile defense system design, development, integration, test and evaluation, system level engineering and integration, and acquisition by developing, hosting, accessing, or otherwise acquiring prototypes, data, models, and simulation capabilities; support the preparation of test and evaluation plans and procedures, conduct analysis, perform evaluations, and prepare reports related to missile defense tests, demonstrations, architectures, designs, and concepts. The JNTF will lead or participate in architecture level cost and operational effectiveness assessments (COEA) for BMDO. The JNTF will support the BMDO system acquisitions by developing, operating, maintaining, and enhancing the JNTF's BM/C^{4}I Test Bed Node and the Ballistic Missile Defense Network (BMDN).

2. Develop, host, and integrate models and simulations for missile defense based upon Program Office approved data. This will include the integration of other activities such as Theater Air Defense/ C^{4}I, attack operations, and C^4 Intelligence, Surveillance, Reconnaissance (C^{4}ISR) to assist in development of combined and/or joint doctrine, requirements, and CONOPS. The JNTF will provide secure, real time, interoperable space and missile defense-related systems models to the joint and combined wargaming and exercise community.

3. Support Independent Verification and Validation (IV&V) of the missile defense BM/C^{4}I system, V&V of missile defense systems to support the BMDO's accreditation decisions; and support V&V of the overall missile defense architecture.

4. Serve as the BMDO Center for modeling and simulation of DIA approved threat systems and associated threat phenomenology.

5. Represent BMDO in conducting liaison with DoD components and other agencies desiring JNTF host/tenant arrangements.

D. EFFECTIVE DATE

This Charter is effective upon signature, and supersedes the memoranda of agreement between the BMDO and the Army, Navy, Air Force in 1986, with the Air Force Space Command in 1992, and the US Space Command in 1994.

Malcolm R. O'Neill

MALCOLM R. O'NEILL
Lieutenant General, USA
Director
January 31, 1995

Attachment 2

JTNF Partners

Joint Theater Air & Missile Defense Organization (JTAMDO)

United States Atlantic Command (USACOM)

United States Space Command (USSPACECOM)

Joint Interoperability Test Command (JITC)

Air Force Space Command (AFSPC)

Space Warfare Center (Air Force Space Command)

Army Space Command (ARSPACE)

Space Battle Labs (Army and Air Force)

Army Space and Missile Defense Center (SMDC)

Army Training and Doctrine Command (TRADOC)

Air Force Space and Missile System Center (SMC)

Air Force Tactical Air Command & Control Simulation Facility (TACCSF)

Universities (Johns Hopkins University/Applied Physics Lab, University of Alaska, University of Colorado, Colorado Springs, Carnegie-Mellon University)

(OSD) High Performance Computing Management Office (HPCMO)

OASD/C3I

JSIMS/JWARS Program Offices

Defense Modeling & Simulation Organization (DMSO)

Joint Warfighting Center (JWFC)/Joint Training, Analysis, and Simulation Center (JTASC)/(C4ISR) Joint Battle Center (JBC) and Decision Support Center (DSC)/Warrior Preparation Center (WPC)

National/Army/Air Force/Navy War College(s)

Attachment 3

JNTF TECHNICAL ADVISORY PANEL (TAP) MEMBERS

Maj Gen R. Rankine, Jr., USAF (Ret), Chairman

Gen J. Piotrowski, USAF (Ret)

GEN G. Otis, USA (Ret)

LTG J. Garner, USA (Ret)

VADM D. Frost, USN (Ret)

RADM W. Meyer, USN (Ret)

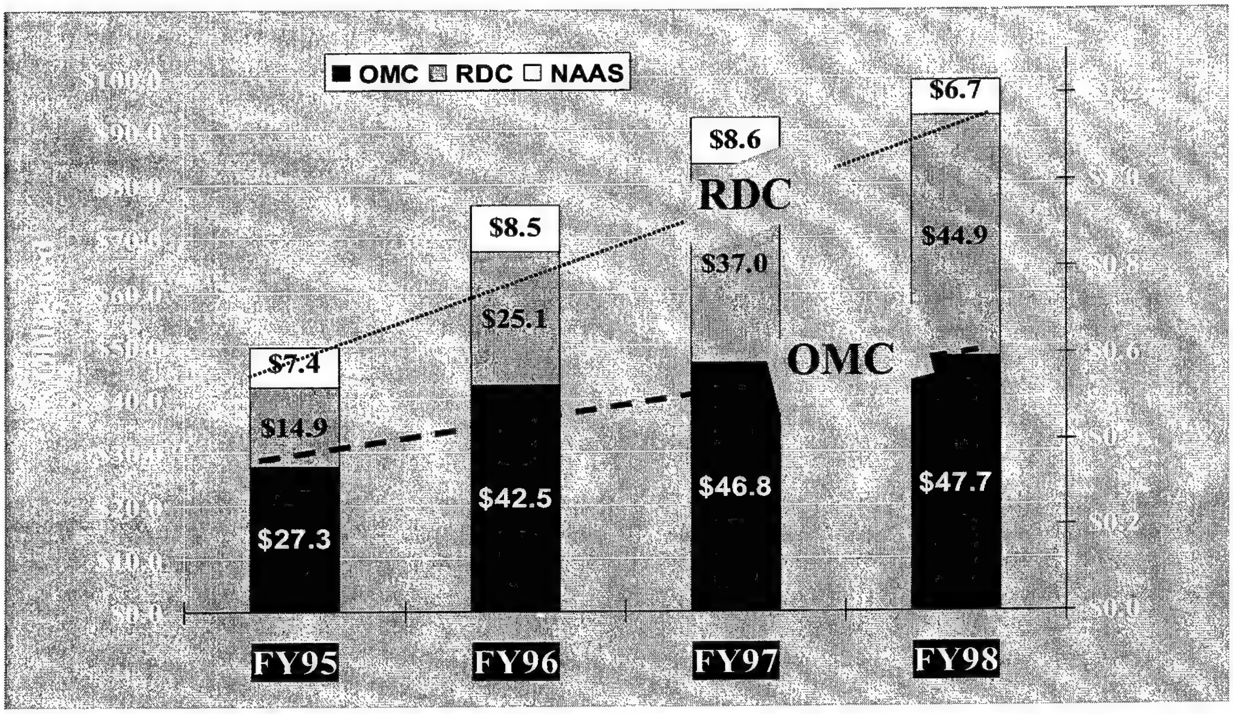
Dr. G. Yonas, Sandia National Laboratories

Dr. J. Doyle, California Institute of Technology

Attachment 4

JNTF Summer Review Briefing, 12 August 1998:

JNTF Contract Obligations (per year)



OTD 26 April 1999

MEMORANDUM FOR OUSD(A&T), Director, TSE&E, ATTN: Dr. Patricia A. Sanders, Room 3E1060, Pentagon, Washington, DC 20301

SUBJECT: Intra-Agency Plan, Office of the Test Director (OTD), Precision Guided Weapons (PGW) Countermeasures (CM) Test and Evaluation Directorate

This Directorate operates under DoD Directive 5129.47, 2 August 1989, which defines our mission as "direct, coordinate, support, and conduct CM/CCM analysis, test, and evaluation activities applicable to all PGW systems." We are, by definition, as cross-Service testing organization that has historically focused on electro-optical and infrared systems (PGWs, sensors, warning devices, and CMs). Within the past 10 years, we have expanded that focus to include millimeter wave, acoustic, and high-power microwave systems.

OTD bases its evolutionary program plan to support independent Service-wide countermeasure/counter-countermeasure (CM/CCM) analysis, modeling and simulation, testing, and evaluation on 25 years of historical experience. The attached program plan delineates not only past performance, but our future plans, including projected cross-Service and cooperative testing.

Statistics show that from 1972 through 1998 OTD test sponsors have been balanced over all services, including: Army (31 percent); Air Force (29 percent); Navy (22 percent); and joint/ cooperative/cross-Service (18 percent). Ongoing foreign exploitation activities comprise about 20 percent of our current workload and are about equally distributed among the various DoD and Service intelligence agencies.

Our activities complement, but do not duplicate, the Services' development programs, and have proven to be highly effective and resource sensitive. The cooperative approach, coupled with our extensive knowledge base, has resulted in significant improvements to many PGW systems (e.g., Stinger, Copperhead, HELLFIRE, TOW, PAVEWAY, Maverick, SLAM, and SFW). Additionally, cooperative testing with the operational community has led to many improvements in tactics and doctrine when employing and facing PGW systems.

OTD is the only CM/CCM T&E activity possessing and using a joint Service testing perspective to enhance intra-Service technology sharing. Joint cooperative testing, analysis, and evaluation (a methodology we pioneered) are focused, efficient, and cost-effective, and eliminate redundant testing. The above attributes, coupled with an aggressive cross-Service test schedule, clearly puts us at the forefront of intra-agency and intra-Service test and evaluation.

Attachment
As stated

MICHAEL A. SCHUCK
Director

Precision
Guided
Weapons
CounterMeasures
Test and Evaluation Directorate

White Sands Missile Range
New Mexico 88002-5519

PROGRAM PLAN for Fiscal Year 1999

28 September 1998

MISSION STATEMENT

The Office of the Test Director (OTD), Precision Guided Weapons Countermeasures (PGWCM) Test and Evaluation (T&E) Directorate, is chartered to direct, coordinate, support, and conduct countermeasure/counter-countermeasure (CM/CCM) T&E activities applicable to all precision guided weapon systems and related components, as well as any other T&E activities directed by the Deputy Director for Test, Systems Engineering, and Evaluation (DDTSE&E), Resources and Ranges, Under Secretary of Defense for Acquisition and Technology [USD(A&T)].

OTD OBJECTIVES

•Determine the performance and limitations of precision guided weapon systems, subsystems, and components in a CM environment, beginning at the concept formulation stage and extending throughout their operational lifetimes.

•Evaluate the practicability and effectiveness of CM/CCM techniques and devices against guided weapon systems, subsystems, and components, with emphasis on the operational environment.

•Provide information and recommendations about the effectiveness of CM/CCM techniques and devices to weapon system developers, Developmental Test and Evaluation (DT&E) and Operational Test and Evaluation (OT&E) Agencies, and DoD components.

•Develop, maintain, and disseminate a lexicon of PGWCM susceptibility and vulnerability terminology, including a collection of related DT&E and OT&E test conditions, analyses, and evaluation criteria.

Table of Contents

Section 1. Program Overview

1.1 INTRODUCTION

a. During fiscal year 1998 (FY98), OTD independently prepared and published 23 major countermeasure (CM)/counter-countermeasure (CCM) technical and analysis reports providing specific susceptibilities, vulnerabilities, test results, conclusions, and recommendations on precision guided weapon (PGW) systems to developers, users, and decision makers. Twenty-one more reports are in the final stages of development. Additionally, we conducted/ supported 24 static, captive-flight, or dynamic CM/CCM field tests (summarized in Section 2) and 3 simulation tests of PGW weapon systems, independent of the developer or user. The Appendix lists those systems OTD has tested from FY74 through FY97.

b. OTD is continuing CM/CCM development, testing, and evaluation in: laser beam riders, next generation focal plane array (FPA) systems, shoulder-fired IR missiles, threat warning and active defense systems, millimeter wave (MMW) applications, and sensor fusion. These initiatives include U.S., cooperative multi-national, intelligence community, and foreign exploitation programs across the entire spectrum of PGW. Continuing and follow-up activities will be carried over into FY99 (summarized in Section 2).

1.2 TRENDS

a. OTD supports, and is involved in, several on-going PGW developments--some evolutionary, others revolutionary. On the evolutionary side, PGW have become highly accurate and reliable through improved guidance techniques (e.g., beam riding, LIDAR) and hardware. Improved seeker technology (e.g., focal plane arrays) and greater computer processing power make today's PGW significantly more resistant to CMs. All these developments provide increased weapon accuracy, potentially resulting in smaller, yet more lethal PGW. Weapons platforms will be capable of carrying more of the smaller, and lighter, PGW. On the revolutionary side, improvements in computerized navigation and control systems [e.g., global positioning system (GPS)/inertial navigation system (INS)] have substantially increased the stand-off capabilities of certain PGW. This increased stand-off capability, along with the continued development of guidance methodology, stealth platforms, and low-signature motors/

propellants, makes detecting and countering the attacker a much more difficult problem.

b. Also, due to evolving capabilities in sensor and data fusion, computer miniaturization, and automatic target recognition (ATR), we are witnessing initial developments in the area of brilliant weapons (e.g., BAT). Brilliant weapons development gives new urgency to the task of signature masking and suppression. To this end, OTD plays a highly active role by supporting weapons, sensors, and CM programs resulting from these developments. The increasing use of modeling and simulations augments the development of newer CMs and test methodologies. OTD first used modeling and simulations in the Infrared (IR) Band IV Joint Test and Evaluation (JT&E) Program, and has implemented the *Model, Test, Model* methodology as a major tool to provide rapid and cost-effective CM/ CCM testing.

c. Some truly revolutionary developments are already on the horizon, and OTD is playing an active role in bringing them to fruition. The evolving correlation of spatial, temporal, and spectral information will result in a new generation of PGW that will be ultra-hardened against CM. For example: (1) newer forms of guidance (e.g., improved LIDAR) will be widely employed, (2) new missile seekers will be able to take a real-time spectrum of the target's plume, (3) weapons will selectively target specific regions of high-value targets, and (4) systems will be developed that trick or spoof enemy threat warning systems into collecting false information, thus misrepresenting the enemy's *ground truth*. This misinformation, when relayed to the enemy's command and control headquarters, becomes part of the information warfare methodology.

d. OTD's experience and expertise will be of particular value in areas of highly specialized, state-of-the-art field test instrumentation systems, CM/CCM test devices, and independent CM/CCM analyses. The Directorate will continue to provide decision makers, developers, testers, and users of these emerging technologies with the independent, objective, comprehensive, and timely analysis and test results, conclusions, and recommendations that they need. The most important application of OTD's expertise is incorporating and using our extensive knowledge base in the mission planning process. We are actively engaged in briefing the Joint Requirements Oversight Council (JROC), Commanders-in-Chief (CINCs),

acquisition executives, program executive officers (PEOs), and program managers (PMs) regarding OTD's mission and accomplishments.

e. All of the technological trends presented above support and parallel, on-going geopolitical trends. For example:

(1) We now face a distributed, amorphous, highly changeable threat. This is especially true in operations other than war, and it imposes new situational awareness requirements. For example, in the littoral battlespace, as well as in peacekeeping missions, U.S. forces will be facing land-based threats over regions we do not control.

(2) Proliferation of our PGW systems requires increased emphasis in developing CMs against these weapons systems.

(3) New weapon systems are increasingly being developed through multi-national efforts, which means that we must pay closer attention to interoperability.

f. The developing trends in OTD's mission, as outlined above, coupled with our projected FY99 activities, directly support precision engagement and full dimensional protection--two of the four operational concepts emphasized in Joint Vision 2010.

1.2.1 Test and Analysis Capability and Infrastructure

a. OTD continues to enhance and improve its extensive test and analysis capability. This capability includes a fleet of general-purpose instrumentation vans and trailers (valued at over $25 million), dedicated or unique test assets [e.g., MMW Electronic Countermeasures (ECM) Threat Simulator (METS) van, IR missile seeker test van, foreign missile seekers, CMs]; general-purpose and specialized imagers, radiometric and spectrographic instruments; a vast array of CM devices and equipment (many OTD-developed, one-of-a-kind devices), an extensive suite of hardware and software analytical tools, and a state-of-the-art information management system. With this extensive hardware/software capability, OTD combines the knowledge base represented by highly experienced professionals from both government and contractor services. This combination, which represents a unique and irreplaceable DoD asset, allows us to conduct test and analysis activities world-wide,

b. OTD performs independent testing, analysis, and evaluation throughout a program's entire life cycle, including advanced technology demonstrators (ATD) and advanced concept technology demonstrators (ACTD). We use our extensive knowledge and experience in all aspects of PGW systems to assist the DoD community by providing technical consulting services to OSD, the developers, the testers, and the warfighters.

c. We will continue to maintain and expand, when possible and practical, our inventory of CM devices and resources, as well as domestic and foreign seekers and military hardware. Our inventory includes a very good cross-section of U.S. and foreign man-portable, shoulder-launched anti-aircraft missile seekers; U.S. and foreign laser seekers, and laser warning receivers; a foreign laser beam-rider fire-control system; a suite of lasers and jammers that completely covers the UV to far-IR portions of the electromagnetic spectrum; and a large assortment of U.S. and foreign CM devices. We also maintain an extensive inventory of U.S. and foreign flares, smoke grenades and other specialized pyrotechnics, smoke generators, and special-purpose dispensers/launchers.

1.2.2 Precision Engagement

To successfully complete a mission, a weapon operator must detect, identify, and launch an attack against a pre-determined target that may be intermingled among neutral or friendly forces; furthermore, the target may be employing CM. A wide variety of tools (e.g., visual and IR search and track sets; laser target designators, rangefinders and laser spot trackers; various weapons delivery systems and gun sights; and PGW) and the basic human senses assist in this process. A breakdown in any part of the engagement process, or a failure of any tool to properly perform its function, could jeopardize the success of the mission – intentionally inducing such failures is the application of CM science. OTD has invested over 25 years in perfecting that science in the field and working with developers to harden systems against such attacks.

a. **EO/IR Technologies and Systems**

EO/IR technologies and systems continue to serve as the foundation for OTD's activities with continuing support of all services, the intelligence community, national and international cooperative programs, and the Defense industries. Weapons systems employing guidance and detection systems using these technologies represent the lion's share of

currently fielded and developmental systems. They represent a wide diversity of guidance and control techniques (e.g., semi-active laser, command-to-line-of-sight, imager). They also contain weapons systems that engage the entire spectrum of targets (anti-tank weapons to 2,000-pound laser-guided bombs). These systems represent OTD's "bread and butter," and will continue to receive our dedicated attention.

b. **Millimeter Wave (MMW) Technologies and Systems**

Continuing advances in MMW technology have made this region of the electromagnetic spectrum an attractive alternative to EO-oriented sensors for guided weapon systems. OTD's principal test resource is the METS--a fully featured ECM test bed capable of both collecting and analyzing MMW [22, 32, and 94 gigahertz (GHz)] signals and generating a complete set of active jamming waveforms. The METS has been, and will continue to be, used to support testing in this arena.

c. **Global Positioning System (GPS)-Based Technologies and Systems**

GPS continues to experience more applications in precision guidance, especially in the mid-course phase of long-range standoff weapons. OTD and the Air Force's 746th Test Squadron, part of the 46th Test Group at Holloman AFB, NM, are exploring a partnership in the GPS jamming and spoofing arena. The 746th tests GPS user equipment and provides simulated and test environments for jamming and spoofing various PGWs. The OTD/746th partnership will complement future tests of those weapon systems incorporating GPS guidance capability

1.2.3 Full Dimensional Protection

a. The ability to achieve full dimensional protection requires a very high degree of situational awareness, coupled with the means to protect ones self through direct actions using appropriate CMs. As the threat becomes more sophisticated (both technologically and operationally), the warfighter's ability to quickly and accurately assess his situation depends more on cues from threat warning systems and less on his own senses. Concurrently, the threat's increased sophistication makes an effective response depend more on active and reactive CMs and less on manually deployed CMs and simple maneuvers. As a result, weapons platforms and militarily significant installations (e.g., tactical vehicles, bunkers, command posts, ships) are being outfitted with various types of threat warning systems (e.g., missile

approach warners, laser warners), and integrated defensive aids (e.g., sensors which trigger or deploy expendable CMs like flares and smoke grenades, or active CMs like laser jammers).

b. Because of the scale and scope of the many test and evaluation activities associated with the CM and Integrated Defense System (IDS) programs, OTD's traditional role as the sole test planner and executor has been modified so that OTD has become more of a partner and facilitator. As such, we sponsor, encourage, and foster joint and cooperative tests among developers, testers, and users, and disseminate test data and information as widely as possible throughout the community. We also significantly contribute to, and participate in, these programs with our international partners and allies through our associations with TTCP and NATO RSG-18.

c. In FY97, OTD began a dedicated program (the IDS initiative) that addresses testing, analyzing, and evaluating the various U.S., international, and foreign threat warning and integrated defensive suites. Given the natural divisions in the applications of the available technologies, these efforts focus on the systems as they apply to the various platforms that would mount the equipment [e.g., aircraft, vehicles (point targets), and surface ships (extended targets)].

(1) **Airborne.** The vast majority of aircraft-mounted systems rely on missile plume detection using EO sensors/imagers as the principal means of threat detection (some helicopters also use laser warners). CMs typically include signature reduction (engine/exhaust suppression), expendables (flares of various types), and developmental directed-energy sources (high-intensity lamps and lasers). OTD has developed an extensive capability to test both the detection systems (through cooperative live fire testing using the White Sands Missile Range (WSMR) Aerial Cable Range (ACR) and other test ranges) and the associated CMs (static fly-by testing and live-fire testing using various IR missile seekers). We will continue to expand and refine this capability to address the various man-portable air-defense and air-to-air missiles and to evaluate the effects of CM that an adversary might employ to defeat the detection systems or the associated CMs.

(2) **Vehicles and Point Targets.** This class of platforms includes tactical vehicles, small surface craft (e.g., landing craft), and any small ground installation or fortified position. These platforms use laser warning

receivers as the principal threat warners (there are a few programs experimenting with modified aircraft plume detectors). CMs for these applications typically include expendable decoys, signature reduction (engine/exhaust suppression) camouflage/concealment, expendables (smoke grenades of various types), area screening systems (e.g., tank exhaust smoke generators), and laser false target generators. The littoral warfare aspects of protecting small craft from laser-guided weapons have become of particular interest to the Navy and represent some very real technical and operational issues. OTD and NRL are currently working together to define and resolve these issues. We will continue to expand and refine our extensive capability to test ground-based detection systems and their associated CMs, and to evaluate the effects of CMs/CCMs that an adversary might employ to defeat the detection systems or their associated CMs.

(3) **Ship and Extended Target Applications.** This class of platforms includes capital ships and large land installations. These platforms use laser warning receivers as the principal threat warners; radar-based detection and other types of theatre-wide warning systems using other platforms also may be used. CMs associated with these applications typically include camouflage/concealment, large quantities of expendables (e.g., mortar-based smoke rounds), wide-area screening systems (e.g., fog-oil smoke generators), and laser false target generators/area protection systems. Because of the large physical size of these targets, typical engagements require large or multiple weapons. Protecting these targets represents a very real, technical challenge both in terms of detecting the threat and employing CMs that will defeat the threat and cause it to fall far enough away to prevent serious damage. The naval application is particularly challenging. OTD has been at the forefront of testing these weapons systems and developing CMs that can be employed effectively and safely to defeat them. We will continue to expand and refine this capability and to evaluate the effects of CMs that an adversary might employ to defeat the detection systems or their associated CMs.

1.2.4 Laser Beam-Rider Systems and Technologies

Because PGWs using laser beam-rider guidance techniques represent a significant and extremely CM-resistant threat, OTD is focusing specific attention on researching and understanding how laser beam-riders function and how they may be defeated. Jamming a beam-rider guidance link has

always been a difficult technical problem; now with the proliferation of both anti-tank and anti-aircraft beam-rider missiles, the threat has become a serious survivability issue. OTD will continue to evaluate beam-rider missiles, with efforts directed at both detecting and jamming these missiles and their associated tracking systems. OTD has acquired an anti-tank guided missile (ATGM) beam-rider fire-control system, illuminator, and missile guidance section, and is developing a test-bed to use in evaluating various EO CM techniques. As soon as we complete our field tests of laser beam-rider EO CMs, this equipment will be made available for cooperative experimental activities.

1.2.5 Foreign Systems Exploitation

Complimentary to OTD's precision engagement and full dimensional protection initiatives, our foreign exploitation test, and analysis activities continue to provide significant contributions; results of our efforts have provided a comprehensive knowledge base that gives U.S. developers, tacticians, and warfighters the unique capability of assessing the effectiveness of foreign PGW and CMs. OTD continues to work closely with the Intelligence community in defining foreign materiel acquisitions, presenting symposium papers, and conducting exploitation and CM tests of foreign assets. Additionally, we provided test data and technical assistance to the intelligence community and OSD in a special white paper on foreign active protection systems and a symposium paper on foreign laser jammers.

1.2.6 Modeling and Simulation

Modeling and simulation have always played significant roles in the PGW acquisition process. With the availability of relatively inexpensive, high-performance computers, modeling and simulation provide viable tools for the field tester. Modeling and simulation can be used to predict CCM performance enhancements that our systems might employ to improve their performance in a CM environment. They also can be used to assess the effectiveness of an adversary's CM when used against our systems. Modeling and simulation can also be used as effective tools for planning tests by validating test data, as well as evaluating test scenarios, CM parameters, and test geometry, thus saving time and money. To take advantage of these new capabilities, OTD will continue to maintain a modeling and simulation group to support CM tests, analyses, and evaluations for both U.S. and foreign PGWs.

1.3 MILESTONE REPORTS AND ANALYSES

a. In 1988, OTD published AR-1-88, *An Assessment of Electro-Optical Counter-Countermeasures and Laser Hardening Techniques for Generic Classes of Electro-Optical Weapon Systems* (U), SECRET, 17 March 1988, which rapidly became the DoD standard for testing and evaluating CMs to PGW systems (over 200 copies distributed). Since its publication, the world of PGW systems has realized many changes and advancements that have created gaps in the analysis and rendered some of the material obsolete. To address this problem, OTD is updating the report to reflect these changes. The updates include totally reformatting the original document and adding about 40 percent new/updated material. The report will be published in early FY99.

b. In March 1998, OTD published the initial *Missile Approach Warning System (MAWS) Test Methodology*. We are currently revising the methodology to include a broader scope and more in-depth discussion of the testing process, as well as data reduction and analysis. This document will serve as the standard for planning and conducting MAWS tests in a variety of field environments under various test conditions. The revised methodology will include sections on instrumentation; data collection, reduction, and analysis; test ranges and test facilities; and test procedures. OTD will continue to update the methodology as test techniques and procedures are refined through use.

c. Also during 1998, we began migrating toward a *paperless office* and multi-media reporting. OTD produced four CD ROM based paperless reports (AN/AAR-47, Precision Guided Mortar Munition, RSG-18, and High-Energy Toroidal Vortex). This medium is much less expensive than publishing paper reports (less than $1 per copy), and allows the use of multi-media tools and presentation techniques which greatly enhance the readability and value of the material (e.g., hyperlinks to graphics, video clips). The CD's storage capacity permits archiving not only the report, but a complete record of a test events (e.g., test data, test plans, previous reports, analysis reports). We will continue to use and refine these reporting techniques.

d. Over the last few years, OTD has collected a significant database on CM design, operation, performance, and effectiveness against U.S. and foreign laser-guided weapons systems. We will incorporate these data into a

comparative analysis of semi-active laser-guided weapons. The purposes of this analysis is to provide a comprehensive description of U.S. and foreign PGW system operation and performance, a comparative analysis of system operation, and an assessment of CM effectiveness when applied to each system.

1.4 INFORMATION SYSTEMS

a. **Year 2000 (Y2K) Compliance**

During FY98, OTD began addressing the Y2K-compliance issue. By upgrading/replacing all non-compliant office desktop systems and network servers, we have reached essentially 100-percent compliance in all critical office systems. Preliminary evaluation of our field data-collection systems indicates that we are about 95-percent compliant; we will address the remaining 5 percent during FY99. Also during FY99, OTD will test and assess any "legacy systems" for Y2K compliance, replacing, upgrading, or retiring those systems as appropriate.

b. **High-Speed Networking and Internet Access**

As part of this ongoing program, we upgraded our entire building network infrastructure to an asynchronous transfer mode (ATM) switching system. This upgrade provides OTD with a direct, high-speed connection to the Internet via an OC3 connection to the Defense Research and Engineering Network (DREN).

Section 2. FY98 Accomplishments and Projected Activities

Listed below are OTD's accomplishments for FY98. Table 1 lists our projected activities. These evolving activities depend on test item and resource availability, as well as funding.

Tests

- Advanced Owl Off-Axis Laser Detection System static and flight tests, WSMR, NM, Nov 97.
- Active Electro-Optical Threat Characterization and Collection System (AEOTCCS) static and flight tests, WSMR, NM, Nov 97.
- Advanced Tactical Aircraft Sensor (ATAS) static and flight tests, WSMR, NM, Nov-Dec 97 and Mar 98.
- BeamRider Detection (BeRD) System static and flight tests, WSMR, NM, Nov-Dec 97 and Mar 98.
- Precision Guided Mortar Munition Phase I captive-flight tests, Yuma Proving Ground, AZ, Nov 97.
- NATO Research Study Group (RSG-18) tests, WSMR ACR, NM, Nov 97.
- High Angular Resolution Laser Irradiance Detector (HARLID) static and flight tests, WSMR, NM, Dec 97.
- AN/AAR-47 Microprocessor Upgrade Phase 1, WSMR ACR, NM, Jan 98.
- Advanced Strategic and Tactical Expendables (ASTE) Development Test and Evaluation (DT&E), Eglin AFB, FL, Feb-Apr 98.
- Advanced Infrared Countermeasure Munition (AIRCMM), Eglin AFB, FL, Feb-Apr 98.
- AN/AAR-47 Microprocessor Upgrade Phase 2, WSMR ACR, NM, Mar 98.
- Foreign Laser Guided Bomb (FLGB), WSMR, NM, Apr-May 98.
- Modeling and Simulation Group Pilot Program for Foreign Laser Beam Rider (FLBR), WSMR. NM, Apr-May and Sep 97.
- MJU-49B Decoy Flare Development Tests, China Lake, CA, Jun 98.
- MJU-49B Decoy Flare Operational Assessment, China Lake, CA, Jun 98.
- AN/AAR-47 Microprocessor Upgrade Phase 2B, WSMR ACR, NM, Jul 98.
- Universal Semi-Active Laser Guidance (SALG) Jammer (USJ), Eglin AFB, FL, Jul 98.
- H-60 Helicopter Self-Protection System (SPS) Operational Tests and Evaluation (OT&E), China Lake, CA, Jul 98.
- IR BOL Flare static seeker tests, China Lake, CA, Jul 98.
- Small Base-Line Vector Scoring (SBVS) System, WSMR ACR, NM, Aug 98.
- Sensor Fuzed Weapon P^3I, Eglin AFB, FL, Aug 98.
- The Technical Cooperation Program (TTCP) tests of laser guided weapon decoys in a littoral scenario, Aberporth, UK, Aug 98 (first littoral warfare test).
- Stand-Off Land Attack Missile-Expanded Response (SLAM-ER) tests, WSMR, NM, Sep 98.
- AEOTCCS II Follow-On flight tests, China Lake, CA, Sep 98.

Conference/Symposia Participation and other Briefings

- Advanced Technology Expendables and Dispenser Systems Conferencce
- U.S. Army Tank-Automotive and Armament Research, Development, and Engineering Center Conference
- Infrared Information Symposia
- International Test and Evaluation Association
- Government Accounting Office (intelligence brief)
- Institute for Defense Analysis (intelligence brief)
- Government Accounting Office (CM brief)
- Institute for Defense Analysis (CM brief)
- Foreign Materiel Acquisition Board (requirements brief)
- Defense Staff Management College (CM 101 course)

Other

- Continuing participation in rotational training assignments to Washington, DC
- Continuing participation in Counter Precision Guided Muitions (Air Force Red Team)

TABLE 1. OTD PROJECTED ACTIVITIES

Project	Acquisition Category	Status	Area
Suite of Integrated Infrared Countermeasures (SIIRCM)/Common Missile Warning Systems (CMWS) (including Development Tests and Independent Operational Test and Evaluation)	ACAT IC	FY99/00 tests	Joint Army/Navy /AF
Joint Tactical Unmanned Aerial Vehicle (UAV)	ACAT ID	Coordinating	Navy lead
AIM-9X	ACAT ID	Coordinating	Joint Navy/AF
AN/AAR-47 Sensor Upgrade	ACAT IC	2QFY00 test	
Joint Stand-Off Weapon System (JSOW)	ACAT ID	Coordinating	
Joint Direct Attack Munition (JDAM)	ACAT ID	TPG member	AF lead
Joint Air-to-Surface Stand-off Missile (JASSM)	ACAT ID	Coordinating	
Armored Vehicle Integrated Laser Warning System and CM to Semi-Active Laser-Guided Munitions	na	FY99 test	TTCP
Ship-Borne Laser Warning System Demonstration	na	FY99 test	
Precision Guided Mortar Munition (PGMM)	ATD	FY99 test	
Longbow HELLFIRE Seeker	ACAT IC	FY99 test	
Missile Warning Sensor Demonstration	na	FY99 test	
Laser Warning Receiver System (LWRS)	ACAT III	4QFY99 tests	
Multi-spectral Countermeasure Advanced Technology Demonstration	ATD	Planning SA; 4QFY99/1QFY00 test	Army
Suite of Integrated Infrared Countermeasures (SIIRCM) (including captive seeker tests 1 and 2)	ACAT IC	FY99/00 tests	
Electronic Warfare Advanced Technology (EWAT)	ATD	FY99 test	Navy/Marines
Laser Warning Sensor (LWS) systems: ROBIN, Advanced OWL, and the Active Electro-Optical Threat Characterization and Collection System (AEOTCCS)	ATD	FY99 test	
Tactical Aircraft Directed Infrared Countermeasure (TADIRCM)	ATD	FY99 tests	
Integrated Electronic Warfare System	na	TPG member	
Extending the Littoral Battlespace	na	Coordinating	
V-22 Osprey	ACAT ID	Planning SA FY99-FY00 test	
AH-1W Electronic Warfare (EW) Suite	na	1QFY99 test	
Standard Missile Block 2	ACAT IC	Coordinating	
Advanced Amphibious Assault Vehicle (AAAV)	ACAT ID	Coordinating	
Naval Research Lab Laser Warning Receiver (LWR)	na	Coordinating	
Stand-off Land-Attack Missile-Enhanced Response (SLAM-ER)	ACAT II	FY99 test	

FY	= fiscal year	Q	= quarter
AF	= Air Force	TPG	= test planning group
P^3I	= pre-planned product improvement	ACTD	= Advanced Concept Technology Demonstration
SA	= susceptibility analysis		
ATD	= Advanced Technology Demonstration	na	= not applicable
TTCP	= The Technical Cooperation Program Panel 10		
IPT	= integrated product team		

Project	Acquisition Category	Status	Area
Sensor Fuzed Weapon (SFW) P^3I	ACAT ID	FY99 test	Air Force
Air-to-Ground Weapon System Evaluation Program (A/G WSEP)	na	FY99 test	
IR Maverick with generation II focal plane array	ACAT III	TPG member	
F-22	ACAT ID	Coordinating	
Space-Based Infrared System	ACAT ID	Coordinating	
AGM-65-H Service Life Extension Program	na	Coordinating	
Low-Cost Autonomous Attack System (LOCAAS)	ACTD	IPT member	
Special Operations Command/Directed Infrared Countermeasure (SOCOM/DIRCM)	ACAT ID	FY99 test	
Advanced Strategic and Tactical Expendables Independent Operational Test and Evaluation	ACAT ID	Coordinating	
Counter Precision Guided Munitions Red Team	na	As required	
Foreign Air-to-Surface Tactical Missile Seeker--TV-Guided (FAST MISS-B)	na	Coordinating FY99/00 test	Intelligence Community
Mobcap Crown	na	Coordinating	
Foreign Active Protection System (APS)--*Shtora*	ACTD	1QFY99 test	
Foreign Active Protection System (APS)--*Drozd*	ACTD	1QFY99 test	
Foreign Active Protection System (MMW)		Coordinating FY00 test	
Integrated Defense System (IDS)	na	Coordinating	
Foreign Active Submunition Program (FASP)	na	Coordinating	
Foreign Laser Illuminator Night Sight	na	FY99 test	
Foreign Precision Guided Munition-B (FPGM-B)	na	Coordinating	
Modeling and Simulation for Osprey Analysis	na	On-going through FY02	Modeling and Simulation
Laser Beam Rider Modeling and Simulation Pilot Program	ACTD	FY99 test	
Optical Cross-Section Test Series	na	FY99 tests	
Model Acquisition to Support CM Evaluation	na	FY99 test	

FY = fiscal year
AF = Air Force
P^3I = pre-planned product improvement
SA = susceptibility analysis
ATD = Advanced Technology Demonstration
TTCP = The Technical Cooperation Program Panel 10
IPT = integrated product team
Q = quarter
TPG = test planning group
ACTD = Advanced Concept Technology Demonstration
na = not applicable

Section 3. IR Band IV Joint Test and Evaluation Program Outbriefings

Listed below are those Commander's-in-Chief and agency representatives to whom OTD presented program outbriefings, including video clips of live-fire test results.

- Integrated Air Defense System Forum, Nellis AFB, NV, Jun 97
- Central Intelligence Agency, Washington, DC, Aug 97
- 53rd Test Wing/Air Combat Command, Eglin AFB, FL, Aug 97
- Air Mobility Command, Scott AFB, IL, Aug 97
- Naval Surface Warfare Center, Crane, IN, Aug 97
- Advanced Strategic and Tactical Expendables, Wright-Patterson AFB, OH, Aug 97
- Tank-Automotive and Armament Research, Development, and Engineering Center, Picatinny, NJ, Aug 97
- Communications and Electronic Command, Night Vision Laboratory, Fort Monmouth, NJ, Aug 97
- Joint Chiefs of Staff J-8, Washington, DC, Aug 97
- Joint Test and Evaluation—Lessons Learned, Nellis AFB, NV, Aug 97
- 57th Test Group, 547th Intelligence Squadron, Joint Combat Survival Air Rescue, and Joint Suppression of Enemy Air Defense, Nellis AFB, NV, Aug 97
- Naval Air Warfare Center and VX9, China Lake, CA, Aug 97
- Joint Chiefs of Staff J-8, Washington, DC, Sep 97
- Director, Test, Systems Engineering, and Evaluation, Washington, DC, Sep 97
- Director, Secretary of the Air Force/Test and Evaluation Programs, Washington, DC, Sep 97
- Special Operations Command, Operational Test and Evaluation Office (J-3E), McDill AFB, FL, Oct 97
- Science Advisor, Central Command, McDill AFB, FL, Oct 97
- Special Assistant to the Commander-in-Chief, U.S. Southern Command, Technology and Requirements, U.S. Southern Command, Washington, DC, Field Office, Oct 97
- Deputy Director, Electronic Warfare, Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, Oct 97
- Science Advisor to the Commander-in-Chief, U.S. Pacific, U.S. Pacific Command, Honolulu, HA, Nov 97
- Science Advisor, U.S. Marine Forces Pacific, Honolulu, HA, Nov 97
- Deputy Commander-in-Chief, Science Advisor to the Commander-in-Chief, and Joint Staff of the U.S. Europe Command, Stuttgart (Patch Barracks), Germany, Dec 97
- Wing Commander and Staff, 31st Air Wing, Aviano Air Base, Italy, Dec 97
- JT&E Program Directors, Office of the Secretary of Defense, Washington, DC, Jan 98
- USAF Intelligence, Deputy and Senior Analyst, Washington, DC, Jan 98
- Principal Assistant (Army) to the Deputy Director, Electronic Warfare, Office of the Under Secretary of Defense (Acquisition and Technology), Washington, DC, Jan 98
- Staff and members of Headquarters, U.S. Pacific Command, Camp Smith, Hawaii, with attending representatives from U.S. Pacific Air Force and the 154th Wing Hawaii Air National Guard, Feb 98

- Staff and members of Headquarters, 7th Air Force, Osan Air Base, Korea, with attending representatives from Headquarters, 8th U.S. Army and the ½ Aviation Regiment, Feb 98
- Staff and members of Combat Developments Directorate, U.S. Army Aviation School, Fort Rucker, AL, Feb 98
- Staff and members of Headquarters, U.S. Atlantic Command, Norfolk, VA, Mar 98
- Class 201, Test and Evaluation, Defense Systems Management College, Fort Belvoir VA, Apr 98

- Additionally, hosted a visit from the G-2 for the Eighth U.S. Army, U.S. Forces Korea (Yongsan, Korea), 4 through 6 March 1998. Discussed CM and potential applications for operational missions in Korea

Section 4. Equipment Development for FY99

4.1 LASER COUNTERMEASURES

OTD will continue to maintain and expand its base of laser CM equipment and devices. Included in this category is the development of Band IV laser jammers, high-PRF laser beam-rider simulators and jammers, as well as laser jammers and UV and IR missile launch simulators. A major part of these developments will be based on laser diodes and diode-pumped lasers. Laser jammers see extensive use in testing EO systems (i.e., imagers of all types), as well as Band IV missile seekers.

4.2 EXPENDABLE COUNTERMEASURES

OTD continues to use a significant quantity of expendable CMs such as flares, smoke grenades, and other pyrotechnic-based CMs. Stocks of these devices will be maintained and replenished as they are used. The majority of these assets will be drawn from service stocks and through service flare developers. In some cases, OTD obtains foreign multispectral smokes and aerosols for us as actual CM threats. The principal users of these CMs (flares) will be the IDS tests. Smokes and other obscurants will be used to support electro-optical (EO)/IR/SAL testing as needed.

4.3 ELECTRO-OPTICAL (EO)/INFRARED (IR) SOURCES

These devices (e.g., high-intensity sources, searchlights, flash lamps) have represented the backbone of OTD CM capabilities, and will be maintained as required. The major development effort will be refining high-intensity ultra violet (UV) lamps and lasers. Additionally, OTD will investigate a proof-of-concept demonstrator of a two-color mid-IR missile warning system (MWS) stimulator. Like the expendable CM, these sources will see use in testing essentially every class of PGW system.

4.4 MILLIMETER WAVE (MMW)

During FY99, OTD plans to upgrade the METS data acquisition and computing systems. We plan to acquire equipment to extend the frequency coverage of the METS to include the frequencies of the next-generation foreign active protection system, which is scheduled for testing in FY00. We also plan to continue acquiring radar absorbing materials and obscurants for evaluation and testing.

4.5 INSTRUMENTATION AND TEST EQUIPMENT

a. During FY99, OTD plans to continue developing more capable instrumentation schemes based on laboratory test-beds. Also, we plan to further develop configuration management strategies for test requirements, set-up, and execution. We will develop software test functions and modify commercial-off-the-shelf (COTS) packages to integrate with our graphical user interfaces (GUI). Spin-off technologies from LabView personal computer (PC)-based data collection include remote GPS tracking, wireless radio frequency (RF) PC connectivity, computer-programmable pulse sequencer (CPROPS), and other field stand-alone point-of-attack PCs. In January 1999, OTD will finish upgrading the current seeker van.

b. During FY98, we completed the mobile atmospheric spectrometer (MAS) and the remote sensing rover (RSR) enhancements. These systems provide the much-needed capability to make atmospheric measurements, characterize CM devices, and obtain target and missile plume signature measurements to support MAWS/MWS and EO/IR seeker tests. Developments included a suite of multispectral instrumentation for UV, visible, IR, MMW, and acoustic arenas. Additionally, OTD will acquire a mid-IR spectral radiometer system (MIR SRS) in January 1999.

c. OTD will acquire commercially available multi-spectral signature suppression material for application on armored vehicle targets. The proliferation of smart weapons in the EO, laser, and MMW regions has spurred development of materials that can suppress retro-reflection of electromagnetic radiation in these wavelengths, thereby reducing the effectiveness of sensors and seekers. Effectiveness of weapon systems operating against targets using such signature suppression materials must be understood and conveyed to DoD decision-makers.

d. During FY99, OTD will work with the contractor to develop a portable long-wave infrared measurement system (PLIMS). The PLIMS will be designed to obtain optical cross-section and transmission (from exterior of the dome through to the detector) measurements of sensors in the far-IR (8 to 12 microns) region of the spectrum. The system, together with its integrated analytical software, will allow the operator to make measurements during actual field testing in lieu of laboratory testing.

4.6 ENTERPRISE COMPUTER NETWORK

OTD will continue to implement the continuous network modernization and maintenance plan by gradually providing high-end users with the latest technology and migrating older, but still serviceable, equipment to less demanding users. By adopting common network software, we will be able to more effectively integrate the office and field computer systems. Future plans include establishing a SIPRNET connection, and expanding the use of the internet for remote data acquisition and transfer.

Section 5. Funding for FY99
(Limited Distribution)

PE 65804D Funding

Funding Type	Dollars (in thousands)						
	FY99	**FY00**	**FY01**	**FY02**	**FY03**	**FY04**	**FY05**
Administration (including travel)	2,286	2,332	2,378	2,426	2,475	2,524	2,574
Personnel (including overtime)	4,758	4,853	4,950	5,049	5,150	5,253	5,359
Contracts (analysis and maintenance)	1,625	1,658	1,691	1,725	1,760	1,795	1,831
Acquisition (hardware, software, instrumentation)	900	1,100	900	900	1,000	1,000	1,000
Test costs (major projects)	1,786	2,657	2,713	2,436	2,581	2,679	2,752
Totals	11,355	12,600	12,632	12,536	12,966	13,251	13,516

Appendix A. Systems Tested from FY74 through FY97

Listed below are those tests OTD has conducted, or participated in, since 1974. An historical timeline and a map of OTD test locations appear at the end of this appendix.

FY97

- Foreign Laser Adjunct Program, White Sands Missile Range (WSMR), NM, Sep-Oct 96.
- Band IV Phases 4 and 5, WSMR, NM, Oct 96.
- Missile Warning Receiver (MWR), WSMR, NM, Oct 96.
- Anti-Tank Guided Missile (ATGM) Defense System (ADS) ACT II, Energetic Materials Research Test Center (EMRTC), New Mexico Tech, Socorro, NM, Nov 96.
- Sensor Fuzed Weapon (SFW) Pre-Planned Product Improvement (P^3I), Yuma Proving Ground (YPG), AZ, Nov 96.
- BAND IV Phase 5a, WSMR, NM, Feb 97.
- BAND IV Phase 4a, WSMR, NM, Mar 97.
- Common Missile Warning Sensor (CMWS), WSMR, NM, May 97.
- Portable HALT, WSMR, NM, May 97.
- Steward Loft, Orogrande, NM, Jun 97.
- C-17, Eglin AFB, FL, Jul and Sep 97.
- C-130 Expendables Operational Assessment, Eglin AFB, FL, Jul 97.
- Anti-Terrorist Technical Advisory Council (ATTAC) High Energy Toroidal Vortex Weapon Test (HETV), El Segundo, CA, Aug 97.
- Air-to-Ground Weapons System Evaluation Program (A/G WSEP) using laser-guided bombs (LGBs), Utah Test and Training Range (UTTR), Dugway Proving Ground (DPG), UT, Aug 97.
- Look Over [optical cross section (OCS) battlefield threshold simulation fidelity effort], WSMR, NM, Aug 97.
- Looking Check [compact optical measurement system (COMS) validation tests], WSMR, NM, Aug 97.
- Looking Glass [OCS analysis of PGM systems], WSMR, NM, periodically during 1997.
- Advanced Infrared Countermeasures Munition (AIRCMM), YPG, AZ, Sep 97.

FY96

- AGM-65H EO CM tests, UTTR, UT, Oct 95.
- Trial Springbok, New Brunswick, Canada, Oct 95.
- SFW surrogate target tests, Eglin AFB, FL, Dec 95.
- SFW EO CM tests of during Initial Operational Test and Evaluation (IOTE) II, Eglin AFB, FL, Jan-Feb 96.
- Advanced Expendable Laser Jammer (AELJ) EO CM tests, WSMR, NM, Feb 96.
- Trial Frantic, West Freugh, Scotland, Mar 96.
- Ictus Skate live-fire tests, YPG, AZ, Mar 96.
- SFW EO CM tests, Sandia, NM, Apr 96.
- Target protection tests during Roving Sands FTX, Melrose, NM, Jun 96.

- LONGBOW hardware-in-the-loop (HWIL) tests, Redstone Arsenal, AL, Jun 96.
- Off-board Laser Countermeasure (OBLCM) tests, Tulsa, OK, Jun 96.
- Foreign Rangefinder Evaluation Exploitation-F (FREE-F, tank #6), WSMR, NM, Jun-Jul 96.
- Night Attack Vision Exploitation-F (NAVE-F, tank #6), WSMR, NM, Jun-Jul 96.
- EO CM support during A/G WSEP (LGBs), UTTR, UT, Jul 96.
- Band IV Phase 5 drone live-fire tests, WSMR, NM, Jul-Aug 96.
- Band IV Phase 4 aerial cable live-fire tests, WSMR, NM, Aug-Sep 96.
- Foreign Laser Adjunct Program (FLAP), Phase 1, WSMR, NM, Sep 96.
- Foreign Laser Adjunct Program (FLAP), Phase 2, WSMR, NM, Sep 96.
- Band IV AFEWES simulations, Fort Worth, TX, Apr-Jun 96.
- Band IV simulations, Lockheed Sanders facility, Nashua, NH, Jun 96.
- Band IV CAS simulations, St. Louis, MO, Jun-Jul 96.

FY95

- LBHMMS ECM tests during high-speed captive-flight, Aberdeen Proving Ground (APG), MD, Feb 95.
- Fast Miss-A (seeker #1) exploitation, WSMR, NM, Mar 95
- AIRCMM static fly-by tests, Orogrande Test Range, Fort Bliss, TX, Feb-Mar 95.
- Band IV Phase 2A tests, Orogrande Test Range, Fort Bliss, TX, Mar 95.
- JTAMS live-fire tests, WSMR ACR, NM, Mar-Apr 95.
- IMIRS EO CM tests, Eglin AFB, FL, Apr 95.
- Foreign Designator/Rangefinder Exploitation, WSMR, NM, Apr-May 95.
- EO CM support during A/G WSEP exercise (Mavericks), UTTR, UT, May 95.
- Foreign Laser Optical Warning Receiver System-C (FLOWERS-C, LWR #3) Exploitation, WSMR, NM, Jun 95.
- Band IV aerial cable target characterizations tests, WSMR ACR, NM, Jun 95.
- VIPER sniper detection system EO CM tests, Range 51, Fort Bliss, TX, Jun 95.
- EO CM support during A/G WSEP (LGBs), UTTR, UT, Jul 95.
- Band IV STINGER-Post Equivalent HWIL simulation tests, EWD, WSMR, NM, Jul 95.
- SOCOM post burnout measurement tests, WSMR ACR, NM, Aug 95.
- AN/AAR-47 (version 20.0 software) EO CM tests, WSMR, NM, Aug 95.
- BEDLAM tests, Eglin AFB, FL, Aug 95.

FY94

- EO CM support during A/G WSEP (Maverick and LGBs), Eglin AFB, FL, Sep 93.
- Band IV Phase 1 static CM tests, Orogrande Test Range, Fort Bliss, TX, Oct-Dec 93.
- LONGBOW fire control radar (FCR) contractor mode development tests (DT) [in ground target mode (GTM)], Orlando, FL, Oct 93.
- Radar and IR signature measurement tests, Eglin AFB, FL, Oct 93.
- BAT captive-flight tests (CFT) #3, WSMR, NM, Oct 93.
- BAT suspended platform tests (SPT) #3, WSMR, NM, Oct-Nov 93.
- LONGBOW FCR electronic CM tests in terminal track mode (TTM), Orlando, FL, Nov 93.
- Navy live-fire tests, Sandia National Laboratories Aerial Cable Test Facility, NM, Jan-Feb 94.
- AGM-130 rugate follow-on tests, Wright-Patterson AFB, OH, Jan 94.

- LONGBOW HELLFIRE modular missile system (LBHMMS) ECM tests in pre-terminal track mode, Redstone, AL, Jan 94.
- Foreign Precision Guided Munition (FPGM) Exploitation, WSMR, NM, Mar-May 94.
- SFW altimeter RF tests, Griffis AFB, NY, Mar 94.
- Repeater jamming ECM tests of the tower-mounted LBHMMS in moving target acquisition (MTA) mode, Orlando, FL, Mar 94.
- Hawk TAS EO CM tests, WSMR, NM, Mar 94.
- Millimeter wave (MMW) radar cross-section measurement tests, APG, MD, May 94.
- LONGBOW ECM (high-speed captive-flight) tests, APG, MD, Jun 94.
- ATIRCM captive-flight tests, Eglin AFB, FL, Jun-Jul 94.
- Band IV Phase 2 Army week, Eglin AFB, FL, Jun 94.
- Band IV Phase 2 Air Force week, Eglin AFB, FL, Jul 94.
- Band IV Phase 2 Navy week, Eglin AFB, FL, Aug 94.
- Band IV Phase 2 Marine week, Eglin AFB, FL, Aug 94.
- Navy MAWS tests, WSMR ACR, NM, Jul-Aug 94.
- ATIRCM MAWS tests, WSMR ACR, NM, Jul-Aug 94.
- LBHMMS ECM (low-speed captive-flight) tests, Eglin AFB, FL, Aug 94.
- BAT development verification tests (DVT) #4, WSMR, NM, Aug 94.
- SOCOM live-fire PBO measurement tests, WSMR ACR, NM, Aug 94.
- Foreign Anti-Ship Missile Defense Decoy Exploitation tests, Norway, Sep 94.
- Electronic warfare advanced technology captive-carry CM tests, China Lake, CA, Sep 94.
- LONGBOW tests, YPG, AZ, Sep 94.
- ATIRCM live-fire tests, WSMR ACR, NM, Sep-Oct 94.

FY93

- EW Suite static and flight CM tests, WSMR, NM, Oct-Nov 92.
- CM support for BAT thermal signature test (TST) 1, WSMR, NM, Oct 92.
- NAVE-A and NAVE-B continuation tests, APG, MD, Nov 92.
- Coffee Can jammer continuation tests, WSMR, NM, Dec 92.
- MMW thermal signature tests, Eglin, AFB, FL, Dec 92.
- CM support for BAT suspended platform test (SPT) 2/acoustics, WSMR, NM, Jan 93.
- AGM-130 static tests, Range 54, Fort Bliss, TX, Feb 93.
- CM support for HELLFIRE II Limited User Tests, Eglin AFB, FL, Feb 93.
- OBLC static tests, Range 54, Fort Bliss, TX, Apr 93.
- MINLAWS static tests, WSMR, NM, Mar 93.
- CM support for BAT captive-flight test (CFT) 2/infrared, WSMR, NM, Mar 93.
- HELLFIRE Enhanced Laser Seeker (HELS) static tests, WSMR, NM, Mar 93.
- AH-64 characterization tests, WSMR, NM, Apr 93.
- OBLC contractor tests, San Diego, CA, Apr 93.
- FREE-D (tank #4) performance and EO CM tests, Range 54, Fort Bliss, TX, Mar-Apr 93.
- NAVE-D (tank #4) performance and EO CM tests, Range 54, Fort Bliss, TX, Mar-Apr 93.
- FREE-E (tank #5) performance and EO CM tests, Range 54, Fort Bliss, TX, May 93.
- NAVE-E (tank #5) performance and EO CM tests, Range 54, Fort Bliss, TX, May 93.
- Five separate Navy LWR static and captive-flight tests, WSMR, NM, May 93.

- AH-1W night targeting system captive-flight tests, WSMR, NM, Jun 93.
- IR Band IV captive-flight tests, China Lake, CA, Jun 93.
- EO CM support for A/G WSEP (LGBs), Eglin AFB, FL, Jul 93.
- AGM-130 (improved seeker) captive-carry tests, Eglin, AFB, FL, Jul 93.
- AGM-130 (rugate) captive-carry tests, Eglin, AFB, FL, Aug 93.
- CM support for BAT thermal signature test (TST) 2, WSMR, NM, Aug 93.
- FREE-C (tank #3) performance and EO CM tests, APG, MD, Aug-Sep 93.
- NAVE-C (tank #3) performance and EO CM tests, APG, MD, Aug-Sep 93.
- CM support for BAT CFT 3, WSMR, NM, Sep 93.
- EO CM support for A/G WSEP (AGM-65G), Eglin AFB, FL, Aug 93.
- ASMAS acceptance tests, WSMR, NM, Sep 93.
- LONGBOW tests, Orlando, FL, Sep 93.

FY92

- FREE-A (tank #1) EO CM tests, WSMR, NM, Oct-Nov 91.
- NAVE-A (tank #1) EO CM tests, WSMR, NM, Oct-Nov 91.
- CM support for HOMS PPT, Eglin AFB, FL, Nov 91, Jan and Apr 92.
- Foreign armor system-A1, -A2, and -A3 tests, Fort Bliss, TX, Feb 92.
- FREE-B (tank #2) performance and EO CM tests, WSMR, NM, Mar-Apr 92.
- NAVE-B (tank #2) performance and EO CM tests, WSMR, NM, Mar-Apr 92.
- HOMS static tests, Eglin AFB, FL, May 92.
- Trial HARFANG support for QAG-13 tests, Defense Research Establishment Valcartier (DREV), Quebec, Canada, May-Jun 92.
- Coffee Can jammer Exploitation, WSMR, NM, Jun and Aug 92.
- Equipment support for BAT tests, Eglin AFB, FL, Jul 92
- EO CM support for A/G WSEP, Eglin AFB, FL, Aug 92.

FY91

- SLAM captive-flight tests, China Lake, CA, Oct 90.
- Skipper captive-flight tests, China Lake, CA, Oct 90.
- Five separate Navy LWR captive-flight tests, WSMR, NM, Dec 90.
- COBRA-TOW sight unit captive-flight tests, WSMR, NM, Dec 90.
- Night vision equipment tests, Tonopah, NV, and WSMR, NM, Oct-Nov 90, and Fort Knox, KY, Nov 90.
- IR Jammer [DAPS and Missile Countermeasure Device (MCD)] tests, Fort Knox, KY, Nov 90, and Fort Bliss, TX, Jan 91.
- FLOWERS-B (LWR #2) Exploitation, WSMR, NM, Apr 91.
- SFW flight tests during SPO DTE, Eglin AFB, FL, Apr-May 91.
- SFW flight tests during AFOTEC IOTE, Eglin AFB, FL, May-Jun 91.
- SFW tests during SPO reliability tests, Kirtland AFB, NM, Jun 91.
- FREE-A and NAVE-A initial investigations, WSMR, NM, May-Jun 91.
- Foreign armor system (FAS-A0) tests, Range 54, Fort Bliss, TX, Jun- Jul 91.
- HOMS static tests, WSMR, NM, Jul-Aug 91.
- IRAD seeker static tests, WSMR, NM, Aug 91.
- LANCE captive-flight tests, WSMR, NM, Sep 91.

- Unity Vision Optics CM tests, WSMR, NM, Sep 91.
- AF Covert Target Designator CM tests, WSMR, NM, Sep 91.

FY90

- CNVEO Sensor II static & captive-flight tests, Otis Air National Guard Base, MA, Sep-Oct 89.
- CNVEO Tone Case Sensor static tests, Otis Air National Guard Base, MA, Sep-Oct 89.
- Two separate IRAD seeker flight tests, WSMR, NM, Dec 89.
- HELLFIRE live-fire tests, Eglin AFB, FL, Jan 90.
- SLIPAR laser warning receiver lab test, WSMR, NM, Apr 90.
- LANA/LAWS flight tests, WSMR, NM, Apr and Aug 90.
- QAG-13 laser warning receivers flight test, WSMR, NM, May 90.
- WALLEYE flight tests, China Lake, CA, Jun 90.
- F/A-18 night attack system tests, China Lake, CA, Jun 90.
- Stinger RMP dynamic tests, Kirtland AFB, NM, Jun 90.
- MOVEOUT tests, WSMR, NM, Jul 90.
- FLOWERS-A (LWR #1) Exploitation, WSMR, NM, Jul-Aug 90.
- SFW drop tests, Eglin AFB, FL, Sep 90.
- IR Jammer [desert armor protection system (DAPS)] tests, Tonopah, NV, Sep 90

FY89

- TOSSING PAPER Exploitation, WSMR, NM, lab tests, Oct-Dec 88; live firing, Jan 89.
- CATS EYES NVG lab tests, WSMR, NM, Jan 89.
- TV HAVE NAP captive-carry tests, WSMR, NM, Jan-Feb 89.
- LWS-20 static & flight tests, WSMR, NM, Feb 89.
- Cluster Style Warning Receiver static & flight tests, WSMR, NM, Feb 89.
- Short Light Pulse Alerting Receiver (SLIPAR) static & flight tests, WSMR, NM, Feb 89.
- Low Altitude Night Attack (LANA) captive-carry & live-fire tests, WSMR, NM, Mar-Apr 89.
- AH-1W COBRA HELLFIRE/TOW captive-flight & live-fire tests, WSMR, NM, Apr 89.
- Stinger RMP (Default)/POST dynamic tests, Kirtland AFB, NM, Apr-May 89.
- Video Sensor System static field test, WSMR, NM, May-Jun 89.
- IR HAVE NAP captive-carry field test, WSMR, NM, Jun 89.
- Hawk TAS static field test, WSMR, NM, Jul 89.
- AHIP Improved Mast Mounted Sight (IMMS) static & flight tests, WSMR, NM, Aug 89.
- SCATS A&B live-fire tests, Kirtland AFB, NM, Aug 89.
- FLYS EYE flight test, Kirtland AFB, NM, Aug 89.
- Stinger RMP dynamic test, Kirtland AFB, NM, Sep 89.

FY88

- LOS-F-H static field tests, WSMR, NM, Oct 87.
- F/A-18 FLIR/LTDR static field tests, WSMR, NM, Jan 88.
- COPPERHEAD static field tests, WSMR, NM, Mar-Apr 88.
- GBU-15 live drops, Eglin AFB, FL, Apr-May 88.
- Stinger RMP dynamic firings, Kirtland AFB, NM, May 88.
- AV-8B Night Attack System flight tests, WSMR, NM, Jun 88.

- CNVEO Sensor static, captive-flight tests, WSMR, NM, Jun 88.
- Laser Maverick live launch tests, WSMR, NM, Jun 88.
- Hawk TAS static field tests, WSMR, NM, Aug 88.
- SFW captive-carry tests, YPG, AZ, Aug 88.
- IR Maverick at sea captive-flight & live-fire tests, Pt. Mugu, CA, Aug 88.
- IR Maverick captive-flight & live-fire tests, China Lake, CA, Sep 88.
- Skipper captive-flight tests, China Lake, CA, Sep 88.

FY87

- AQUILA RPV flight tests, Fort Hood, TX, Jan 87.
- NIMROD dynamic firing tests, China Lake, CA, Feb 87.
- AQUILA RPV flight tests, Fort Hood, TX, Mar 87.
- LANTIRN captive-flight tests, Eglin AFB, FL, May 87.
- Countermeasures Hardened FLIR static field tests, WSMR, NM, May 87.
- NIMROD special purpose tests, Israel, May 87.
- GBU-15 dynamic drop tests, Eglin AFB, FL, Jun-Jul 87.
- COBRA AN/AVR-2 flight tests, WSMR, NM, Jul 87.
- SFW captive-carry tests, WSMR, NM, Sep 87.
- Tracking Support (USAF), Vandenberg AFB, CA, Sep 87.

FY86

- IR Maverick captive-flight tests, San Diego, CA, Oct 85.
- Low Level Laser Guided Bomb (LLLGB) captive-flight tests, Eglin AFB, FL, Nov-Dec 85.
- LANTIRN captive-flight tests, Edwards AFB, CA, Feb 86.
- Joint Aircraft Illumination captive-flight tests, WSMR, NM, Feb-Mar 86.
- Laser Maverick captive-flight tests, WSMR, NM, Apr 86.
- AGM-123A Skipper II dynamic field tests, WSMR, NM, Apr 86.
- Laser Guided Bomb GBU-10 dynamic field tests, WSMR, NM, Apr-May 86.
- TOW-2/Bradley dynamic field tests, Redstone Arsenal, AL, May-Jun 86.
- COPPERHEAD static field tests, WSMR, NM, Jun 86.
- IR Maverick captive-flight tests, San Diego, CA, Jun 86.
- IR Maverick dynamic field tests, Eglin AFB, FL, Jul 86.
- TOW-2/Bradley dynamic field tests, Eglin AFB, FL, Jul 86.
- PAVE TACK (AN/AAQ-9 FLIR) static field tests, WSMR, NM, Aug 86.
- Stinger Basic dynamic field tests, Kirtland AFB, NM, Aug-Sep 86.
- NIGHT FLIGHT captive-flight tests, WSMR, NM, Sep 86.

FY85

- Advanced Receivers flight tests, Pt Mugu, CA, Oct 84.
- Penguin captive-flight tests, Norway, Oct 84.
- Angle Rate Bombing System flight (practice bomb drops), China Lake, CA, Oct-Nov 84.
- Hawk operational scenario tests, WSMR, NM, Nov 84.
- TOW-2 static field tests, Redstone Arsenal, AL, Nov-Dec 84.

- IR GBU-15 dynamic field tests, Eglin AFB, FL, Nov-Dec 84.
- Angle Rate Bombing System (ARBS) flight tests, Yuma, AZ, Jan 85.
- Low Level Laser Guided Bomb (LLLGB) static field tests, WSMR, NM, Jan-Feb 85.
- Penguin dynamic sea tests (Phase I), Norway, Mar 85.
- Hardened HELLFIRE Laser Seeker (HHLS) static field tests, WSMR, NM, Mar 85.
- Penguin dynamic sea tests (Phase II), Norway, Apr 85.
- TOW 1 1/2 dynamic field tests, Redstone Arsenal, AL, Apr 85.
- TOW 1 1/2 dynamic field tests, Redstone Arsenal, AL, May 85.
- Low Level Laser Guided Bomb (LLLGB) captive-flight tests, WSMR, NM, May-Jun 85.
- COBRA HELLFIRE captive-flight tests, WSMR, NM, Jul 85.
- COBRA HELLFIRE dynamic field tests, WSMR, NM, Jul 85.
- Special Illumination static field tests, Fort Bliss, TX, Sep 85.

FY84

- Molecular Flare static field tests, WSMR, NM, Oct-Nov 83.
- TOW-2/Bradley dynamic field tests (moving target), Redstone Arsenal, AL, Oct 83-Jan 84
- XM42A emission characterization tests, Fort Bliss, TX, Dec 83.
- GBU-15 captive-flight tests, Eglin AFB, FL, Jan-Mar 84.
- TOW-2/Bradley dynamic field tests (moving target), Redstone Arsenal, AL, Mar 84.
- Penguin captive-flight tests, Norway, Mar 84.
- Hardened HELLFIRE Laser Seeker (HHLS) static field tests, WSMR, NM, Apr 84.
- 5-Inch Semi-Active Laser Guided Projectile static field tests, WSMR, NM, Jun 84.
- IR Maverick captive-flight tests, Eglin AFB, FL, Jun-Jul 84.
- LANTIRN static field tests, Edwards AFB, CA, Jul-Aug 84.
- Penguin captive-flight tests, Puerto Rico, Aug 84.
- TOW-2/Bradley static field tests (tank target), Redstone Arsenal, AL, Aug 84.
- TOW-2/Bradley dynamic field tests (fixed & moving targets), Redstone Arsenal, AL, Aug 84.
- Hardened HELLFIRE Laser Seeker (HHLS) static field tests, WSMR, NM, Aug 84.
- SEAFIRE static tests, WSMR, NM, Aug 84.
- Advanced Receivers static field tests, WSMR, NM, Aug 84.
- Low Level Laser Guided Bomb (LLLGB) static field tests, WSMR, NM, Sep 84.

FY83

- Low Level Laser Guided Bomb (LLLGB) static field tests, WSMR, NM, Sep-Oct 82.
- Low Level Laser Guided Bomb (LLLGB) static field tests, WSMR, NM, Nov-Dec 82.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, Dec 82-Jan 83.
- Low Level Laser Guided Bomb (LLLGB) static field tests, WSMR, NM, Jan 83.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, Jan-Feb 83.
- Flare static characterization tests, WSMR, NM, Jan-Feb 83.
- Advanced Coded Laser Designator static field tests, WSMR, NM, Feb 83.
- Molecular Flare static field tests, El Toro Marine Base, CA, Feb 83.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, Mar 83.
- Molecular Flare static field tests, Phoenix, AZ, Mar 83.

- IR Maverick captive-flight tests, Pt Mugu, CA, Mar-Apr 83.
- TOW-2/Bradley dynamic field tests (static target), Redstone Arsenal, AL, Jun 83.
- TOW-2/Bradley dynamic field tests (moving target), Redstone Arsenal, AL, Jun 83.
- Long Wavelength Laser Warning Receiver static field tests, WSMR, NM, Jun 83.
- Penguin captive-flight tests, Norway, Jun 83.
- TOW-2/Bradley dynamic field tests (moving target), Redstone Arsenal, AL, Jul 83.
- TOW-2/Bradley dynamic field tests (static target), Redstone Arsenal, AL, Aug 83.
- TBE/CSC Microprocessor Seeker static field tests, WSMR, NM, Aug-Sep 83.
- HELLFIRE Block V, NDC static field tests, WSMR, NM, Aug-Sep 83.
- HELLFIRE (USA) static field tests, WSMR, NM, Aug-Sep 83.
- Molecular Flare (USAF) static field tests, WSMR, NM, Sep 83.

FY82

- CO_2 Laser Detectors static field tests, WSMR, NM, Oct 81.
- IR Maverick captive-flight tests, Eglin AFB, FL, Oct 81.
- Automatic FLIR Tracker (AFT) static field tests, WSMR, NM, Nov-Dec 81.
- Penguin captive-flight tests, Kennedy Space Center, FL, Nov-Dec 81.
- HELLFIRE (Spot Jump Inhibitor) static field tests, WSMR, NM, Jan-Feb 82.
- HELLFIRE (Quadrant Delay Cancellor) static field tests, WSMR, NM, Jan-Feb 82.
- Penguin captive-flight tests, Kennedy Space Center, FL, Mar 82.
- Penguin live-fire tests, Kennedy Space Center, FL, Mar 82.
- IR Maverick captive-flight tests, UTTR, UT, Mar 82.
- Laser Maverick captive-flight tests, WSMR, NM, Mar-Apr 82.
- Laser Maverick live-fire tests, WSMR, NM, Apr 82.
- M-1 (Abrams) Tank static & dynamic IR signature tests, WSMR, NM, Jun 82.
- Low Level Laser Guided Bomb (LLLGB) static field tests, WSMR, NM, Jun-Jul 82.
- Aerosol Scattering field tests, WSMR, NM, Jul 82.
- NVEOL Scanner static field tests, WSMR, NM, Jul 82.
- M-1 (Abrams) Tank dynamic IR signature tests, WSMR, NM, Aug-Sep 82.

FY81

- TOW-2 dynamic field tests, Redstone Arsenal, AL, Oct 80.
- AN/AVR-2 Laser Warning Receiver flight tests, WSMR, NM, Oct-Nov 80.
- TOW-2 static field tests, Redstone Arsenal, AL, Jan 81.
- HELLFIRE captive-flight tests, Redstone Arsenal, AL, Jan-Feb 81.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, Feb-Mar 81.
- IR Maverick captive-flight tests, WSMR, NM, Mar 81.
- HELLFIRE captive-flight tests, Eglin AFB, FL, Mar 81.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, Apr 81.
- CHAOS static field tests, WSMR, NM, Apr 81.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, May 81.
- 5-Inch Infrared Guided Projectile static field tests, WSMR, NM, May 81.
- Infrared CM Aerosol static field tests, WSMR, NM, May 81.
- TOW-2 dynamic field tests, Redstone Arsenal, AL, Jun-Jul 81.

- Target Acquisition Designation Sight/Pilor Night Vision Sensor (TADS/PNVS) static field tests, WSMR, NM, Jul 81.
- 5-Inch Semi-Active Laser Guided Projectile captive-flight tests, WSMR, NM, Jul 81.
- 5-Inch Semi-Active Laser Guided Projectile dynamic field tests, WSMR, NM, Jul 81.
- COPPERHEAD static field tests, WSMR, NM, Jul-Aug 81.
- HELLFIRE static field tests, WSMR, NM, Aug 81.
- Penguin static field tests, Patuxent River, MD, Aug 81.

FY80

- Special Purpose Electronic Support Measures captive-flight tests, WSMR, NM, Oct 79.
- OV-10D OT-III flight tests (FLIR only), WSMR, NM, Oct 79.
- GBU-15 static field tests, WSMR, NM, Nov 79.
- Special Purpose Electronic Support Measures static field tests, WSMR, NM, Nov 79.
- Laser Illuminated Target Detector static field tests, WSMR, NM, Nov 79.
- Special Purpose Electronic Support Measures static field tests, Redstone Arsenal, AL, Nov-Dec 79.
- OV-10D OT-III flight tests (FLIR only), WSMR, NM, Dec 79.
- COMPASS LALOC lab tests, WSMR, NM, Dec 79.
- COMPASS LALOC static field tests, WSMR, NM, Dec 79.
- PAVE PENNY flight tests, Nellis AFB, NV, Jan 80.
- Laser Illuminated Target Detector flight tests, Nellis AFB, NV, Jan 80.
- OV-10D OT-III flight tests (rangefinder only), WSMR, NM, Feb 80.
- COPPERHEAD (CLGP) captive-flight adverse weather tests, Redstone Arsenal, AL, Feb-Mar 80.
- HELLFIRE Laser Seeker static field tests, WSMR, NM, Mar 80.
- Stationary Target ECM System static field tests, WSMR, NM, Apr 80.
- HELLFIRE Laser Seeker captive-flight tests, WSMR, NM, Apr-May 80.
- MULE static field tests, WSMR, NM, May 80.
- TOW static field tests, Redstone Arsenal, AL, Jul 80.
- HARM static field tests, WSMR, NM, Jul-Aug 80.
- CHAOS static field tests, WSMR, NM, Aug 80.
- TOW dynamic tests, Redstone Arsenal, AL, Aug 80.
- COPPERHEAD (CLGP) captive-flight tests, Smoke Week III, Eglin AFB, FL, Aug 80
- 5-Inch Semi-Active Laser Guided Projectile static field tests, WSMR, NM, Sep 80.
- 5-Inch Semi-Active Laser Guided Projectile captive-flight tests, WSMR, NM, Sep 80.
- TOW-2 static field tests, Redstone Arsenal, AL, Sep 80.
- IR Maverick static field tests, WSMR, NM, Sep 80.

FY79

- RF-4B Laser Illumination flight tests, WSMR, NM, Oct 78.
- Angle Rate Bombing System flight tests, WSMR, NM, Oct 78.
- COPPERHEAD (CLGP) captive-flight tests, Eglin AFB, FL, Nov 78.
- Advanced Decoder static field tests, WSMR, NM, Nov 78.
- Tri-Service Laser Seeker (Laser Maverick) static field tests, WSMR, NM, Dec 78.
- COPPERHEAD (CLGP) static field cold-weather tests, Fort Greely, AK, Jan 79.
- COPPERHEAD (CLGP) captive-flight cold-weather tests, Fort Greeley, AK, Jan-Feb 79.
- COPPERHEAD (CLGP) OT-II captive-flight tests, Fort Carson, CO, Mar-Apr 79.

- Doublet Decoder Modification static field tests, WSMR, NM, Apr 79.
- Tactical Air Reconnaissance Pod System flight tests, WSMR, NM, May 79.
- COPPERHEAD (CLGP) captive-flight DT-II tests, WSMR, NM, Jun 79.
- Countermeasures Area Protection captive-flight tests, WSMR, NM, Jul 79.
- Aerosol static field tests, WSMR, NM, Aug 79.
- COPPERHEAD captive-flight (foreign tank target) tests, Redstone Arsenal, AL, Aug 79.
- Special Purpose Electronic Support Measures static field tests, WSMR, NM, Aug 79.
- COPPERHEAD captive-flight (water background) tests, Redstone Arsenal, AL, Aug-Sep 79.
- COPPERHEAD (CLGP) captive-flight (tank target) tests, Redstone Arsenal, AL, Sep 79.
- COPPERHEAD (CLGP) captive-flight (sunlit clouds) tests, Redstone Arsenal, AL, Sep 79.

FY78

- LOPAIR/FLIR comparative evaluation performance tests, DPG, UT, Sep-Oct 77.
- Laser Guided Bomb (PEP) drop tests (2), Nellis AFB, NV, Nov 77.
- COPPERHEAD (CLGP) static field tests, DPG, UT, Nov 77.
- Imaging Infrared Tracker captive-flight tests, Baumholder, Germany, Jan-Feb 78.
- PRF Jam static field tests, WSMR, NM, Feb 78.
- Smart Jam static field tests, WSMR, NM, Feb 78.
- Terrain Reflectance captive-flight tests, WSMR, NM, Apr 78.
- Target Recognition Attack Multisensor (OT-III-B) flight tests, WSMR, NM, Apr 78.
- COPPERHEAD (CLGP) captive-flight tests, Fort Ord, CA, Apr-May 78.
- Laser Guided Bomb (ECP-0049) static field tests, WSMR, NM, May 78.
- Laser Guided Bomb (ECP-0049) captive-flight tests, Eglin AFB, FL, Jul 78.
- Laser Guided Bomb (ECP-0049) "live" drop tests (5), Eglin AFB, FL, Jul 78.
- COPPERHEAD (CLGP) static field tests, WSMR, NM, Aug-Sep 78.
- PRF Jam captive-flight tests, WSMR, NM, Sep 78.
- A-7E FLIR (OT-III-C) flight tests, WSMR, NM, Sep 78.
- A-7E/CO2 Laser flight tests, WSMR, NM, Sep 78.

FY77

- PAVE SPIKE flight & drop tests, Nellis AFB, NV, Sep-Oct 76.
- PAVE PENNY static field tests, WSMR, NM, Oct 76.
- Hardened Tactical Receiver static field tests, WSMR, NM, Nov 76.
- PAVE TACK flight tests, WSMR, NM, Dec 76.
- Doublet Receivers static field tests, WSMR, NM, Dec 76.
- Spoofers static field tests, WSMR, NM, Jan 77.
- Imaging Infrared Maverick JOTE captive-flight tests, Fort Polk, LA, Feb 77.
- Hardened Tactical Receiver static field tests, WSMR, NM, Mar 77.
- Foreign Anti-laser Paint tests, WSMR, NM, Mar 77.
- Doublet Receivers static field tests, WSMR, NM, Mar-Apr 77.
- TOW static field tests, WSMR, NM, Apr-May 77.
- Ground Laser Locator Designator static field tests, WSMR, NM, Jun 77.
- Television Tracking System static field tests, WSMR, NM, Jun 77.
- COPPERHEAD (CLGP) static and captive-flight tests, WSMR, NM, Jul 77.

- Thermal Night Sights static field tests, WSMR, NM, Jul 77.
- Angle Rate Bombing System captive-flight tests, WSMR, NM, Aug 77.
- GBU-15 (CWW) captive-flight tests, WSMR, NM, Aug 77.
- Laser Guided Bomb (PEP) drop tests (30), Nellis AFB, NV, Sep 77.

FY76

- Laser Guided Bomb (PEP) static field tests, Eglin AFB, FL, Oct-Nov 75.
- Laser Guided Bomb (PEP) captive-flight tests, Eglin AFB, FL, Oct-Nov 75.
- Laser Guided Bomb (PEP) live drop tests, Eglin AFB, FL, Oct-Nov 75.
- Laser Guided Bomb (PEP) live drop IOTE, Eglin AFB, FL, Nov 75.
- Tactical Paint Reflectivity static field tests, WSMR, NM, Jan 76.
- Night Sight Spoofers static field tests, WSMR, NM, Jan 76.
- AEQUARE (RPV designator) flight tests, WSMR, NM, Jan-Feb 76.
- HDL Staggered PRF Seeker ground & air tests, WSMR, NM, Feb -Mar 76.
- Laser Guided Bomb (PEP) static field tests, WSMR, NM, Mar 76.
- Imaging Infrared Maverick captive-flight tests, WSMR, NM, Mar 76.
- Hardened Tactical Receiver static field tests, WSMR, NM, Apr 76.
- Laser Guided Bomb (ECP-0049) static field tests, WSMR, NM, Apr-May 76.
- Laser Guided Bomb (NSA Code) static field tests, WSMR, NM, May 76.
- Smoke Tests--Back-scattered Laser Energy Digitizing Equipment (BLEDE) static field tests, WSMR, NM, May 76.
- Target Recognition Attack Multisensor flight tests, WSMR, NM, Jun 76.
- Night Attack Weapon System captive-flight tests, WSMR, NM, Jul 76.
- Laser Designator Tracker System static field and flight tests, WSMR, NM, Aug-Sep 76.

FY75

- HELLFIRE ALS-1 static field tests, WSMR, NM, Sep 74-Jan 75.
- Scene-Magnification Maverick captive-flight tests, WSMR, NM, Jan 75.
- MK-5 Low Light Level, TV, Night Observation Device Long Range, & Modular Observation Device joint tests using A-4 aircraft, WSMR, NM, Feb 75.
- EO Maverick sled track tests, WSMR, NM, Apr 75.
- Cannon-Launched Guided Projectile static field tests (two systems), WSMR, NM, Apr 75.
- Laser Guided Projectile static field tests, WSMR, NM, May-Jun 75.
- Imaging Infrared Maverick static field tests, WSMR, NM, Jun-Jul 75.
- Laser Guided Bomb (PEP) static field tests, WSMR, NM, Jul-Aug 75.

FY74

- Angle Rate Bombing System static field and captive-flight tests, WSMR, NM, Jun 74.
- PAVE SPIKE static field tests, Eglin AFB, FL Apr-Aug 74.

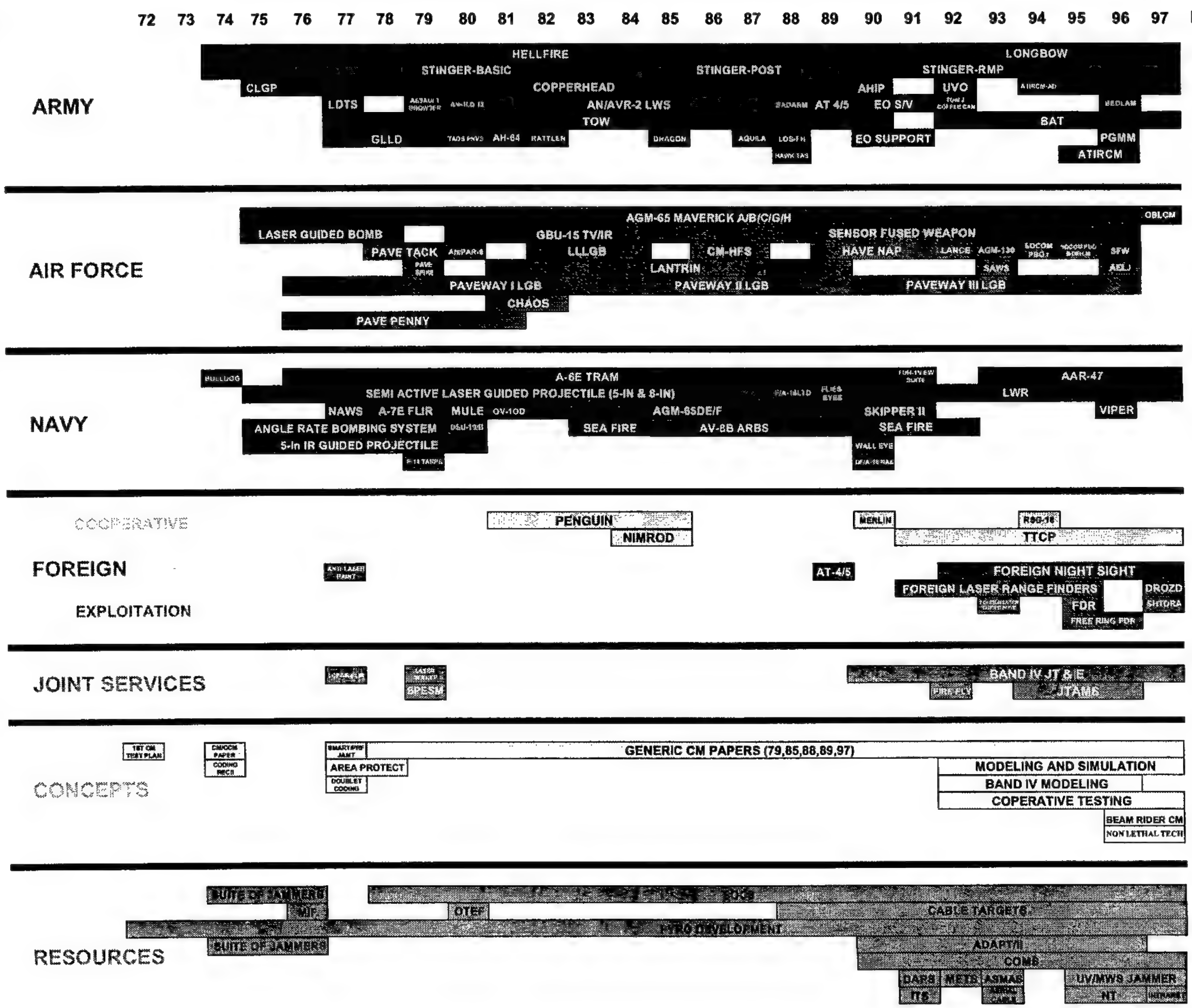
25 YEARS OF COUNTERMEASURES TEST AND ANALYSIS

SPECIAL ANALYSIS & INVESTIGATION

AE EO
AIRCMM
ANTI-ARMOR WPN SYS
APV EO
COCOLS/COBES
EO CCM
FFT
FPGM
FRLJ
Gen EO
GPS
HIGH PRF
IIR
JA EO
JEZIBEL/DISAMS
LASER HARDENING
LCDLD/D
METS
MMW SIG SUPP
NVIR
OATS
R/B SEEKER
RAM
RCS PREDICTION
RUGATE FILTER
SJM
SPJ

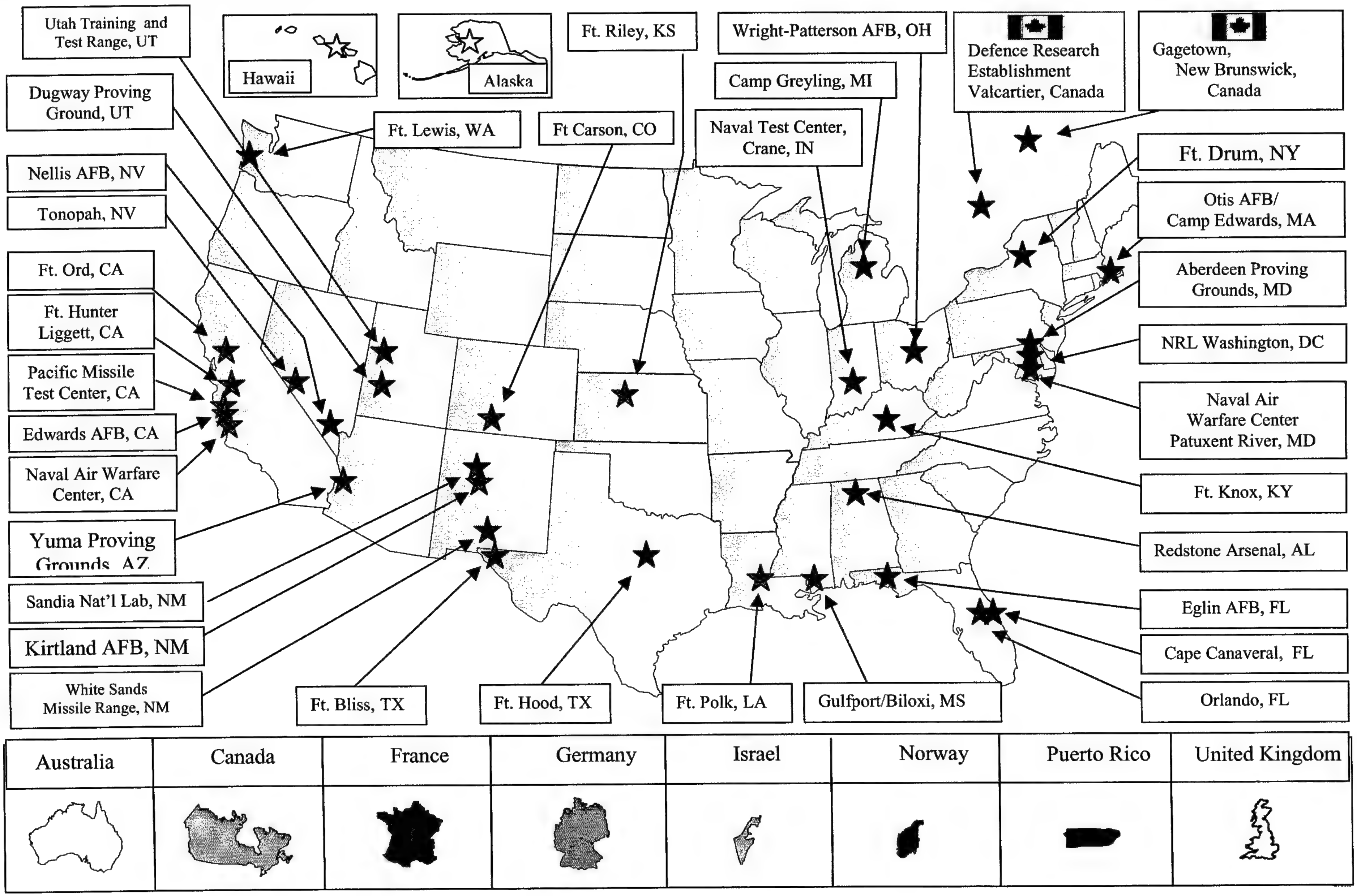
MWS &LWS

AN/AAR-47 MWS
CORDS LWS
CYCLOPS, ROBIN
HALT
LDS-3 LWS
MINLAWS
MWS HANDBOOK
PEACOCK, OWL
POMALS
SPRINGBOK



FUTURE PROJECTS

AAAV
AH-1 W NTS
AIIRCM
AIM9-X
AN/AVR-2 LWR
ASTE IOT&E
ATGM
ATIRCM
IIR SEEKER
IR MAVERICK
JAVELIN
JSOW
LAIRCM
LONGBOW SEEKER
LWS SYS
MATES
MAWS
MERLIN
MULTI-SPECTRAL CM
MV-22/CV-22
NAVY EWAT
OWL
ROBIN
SFW P^3 I
SIIRCM/CMWS
SLAM-ER
SOCOM/DIRCM
STAFF
STEEL PHOENIX
TACAWS
TADIRCM
TOMAHAWK BLOCK 4
TOW FO
UH-1N EW SUITE
X-ROD



OTD WORLD WIDE TEST SITES

List of Abbreviations

A/G WSEP	air-to-ground weapon system evaluation program
AAAV	advanced amphibious assault vehicle
ACR	aerial cable range
ACTD	advanced concept technology demonstration
AEOTCCS	active electro-optical threat characterization and collection system
AF	air force
AIRCMM	advanced infrared countermeasure munition
APS	foreign active protection system
ASTE	advanced strategic and tactical expendables
ATAS	advanced tactical aircraft sensor
ATD	advanced technology demonstration
ATGM	anti-tank guided missile
ATM	asynchronous transfer mode
ATR	automatic target recognition
BeRD	beamrider detection
CCM	counter-countermeasure
CINCs	commanders-in-chief
CM	countermeasure
CMWS	common missile warning systems
COTS	commercial-off-the-shelf
CPROPS	computer-programmable pulse sequencer
DIRCM	directed infrared countermeasure
DoD	Department of Defense
DREN	Defense Research and Engineering Network
DT&E	development test and evaluation
EO	electro-optical
EW	electronic warfare
EWAT	electronic warfare advanced technology
FASP	foreign active submunition program
FAST MISS-B	foreign air-to-surface tactical missile seeker--TV-guided
FLBR	foreign laser beam rider
FLGB	foreign laser guided bomb
FPA	focal plane array
FPGM-B	foreign precision guided munition-B
FY	fiscal year
GHz	gigahertz
GPS	global positioning system
GUI	graphical user interface
HARLID	high angular resolution laser irradiance detector
IDS	integrated defense system
INS	inertial navigation system
IPT	integrated product team
IR	infrared
JASSM	joint air-to-surface stand-off missile
JDAM	joint direct attack munition

JROC	joint requirements oversight council
JSOW	joint stand-off weapon system
JT&E	joint test and evaluation
LIDAR	laser imaging radar
LOCAAS	low-cost autonomous attack system
LWR	laser warning receiver
LWRS	laser warning receiver system
LWS	laser warning sensor
MAS	mobile atmospheric spectrometer
MAWS	missile approach warning system
METS	MMW electronic counter-measures (ECM) threat simulator
MIR SRS	mid-IR spectral radiometer system
MMW	millimeter wave
MWS	missile warning system
na	not applicable
NATO	North Atlantic Treaty Organization
OSD	Office of the Secretary of Defense
OT&E	operational tests and evaluation
OTD	Office of the Test Director
PC	personal computer
PEO	program executive officer
PGMM	precision guided mortar munition
PGW	precision guided weapon
PLIMS	portable long-wave infrared measurement system
PM	program manager
Q	quarter
RF	radio frequency
RSG-18	research study group
RSR	remote sensing rover
SA	susceptibility analysis
SAL	semi-active laser
SBVS	small base-line vector scoring
SFW	sensor fuzed weapon
SIIRCM	suite of integrated infrared countermeasures
SLAM-ER	stand-off land attack missile-expanded response
SOCOM	Special Operations Command
SPS	self-protection system
TADIRCM	tactical aircraft directed infrared countermeasure
TPG	test planning group
TTCP	The Technical Cooperation Program
UAV	unmanned aerial vehicle
USJ	universal semi-active laser guidance (SALG) jammer
UV	ultra violet
WSMR	White Sands Missile Range

3200
19 February 1999

MEMORANDUM FOR DEPUTY DIRECTOR, DEFENSE RESEARCH AND ENGINEERING (LABORATORY MANAGEMENT/ TECHNOLOGY TRANSITION)

SUBJECT: Section 912(c) Defense Agency Plans

Savings within Taxonomy Areas.

The Armed Forces Radiobiology Research Institute's (AFRRI) plan is to achieve the 10% reduction in infrastructure objective, a savings of $557,000 by FY2001 (attachment 1) through the taxonomy of Support Work (infrastructure cuts and reimbursement). However, AFRRI can not reduce the infrastructure by 25% by FY2005 since it cuts below the minimal support work required. To achieve the FY2005 savings objective, AFRRI will require a Reduction in Force (RIF), and plans to save $400K in Corporate Technology Applied Research, and $500K in Support Work.

Savings Already Included in Program Objective Memorandum.

Attached are the budgets for AFRRI since 1992 (attachment 2). The Program Objective Memorandum (POM) cut from $17.9 million in 1992 to $11.0 in 1996 (a 38.5% reduction). Although the 1996 POM increased the budget in the outyears (1997-2003) for inflation, the 1999 POM further decreases the outyear budgets from the actual budget in 1996. The difference between the 1996 POM and the 1999 POM for the FY2001 budget is $1.44 million, an overall savings of 11.55%. While the goal was set to save 10% of infrastructure costs by FY2001, the updated POM reduces the entire budget beyond the infrastructure goal. To reach the goal set by this study, the POM should only have reduced the budget by $557K (see attachment 1).

Infrastructure Savings versus Program Dollars.

a. Since AFRRI is only funded with Program Dollars, infrastructure costs are paid with Program Dollars. To reach the goal to reduce infrastructure costs by 10% by 2001, AFRRI plans to cut the infrastructure costs by cost sharing with tenants. In addition, further cuts in custodial and HVAC support have already been initiated. However, infrastructure costs for the year 2001 are based on fiscal year 1999 cost estimates, and do not consider inflation over the next two years (Attachment 1). Projected costs consider cuts in services to the bare minimum before another Reduction in Force. AFRRI believes it will have to reduce its current workforce significantly to reach the 25% goal unless other means of cost reimbursement can be found.

b. AFRRI is currently considering a RIF to meet its objectives. The RIF will affect research directly as well as infrastructure support. While the numbers have not been finalized, it is projected another $900K must be cut in the payroll for AFRRI to continue

under the current POM. Of these savings, approximately $500K will come from support, veterinary services and radiation services while $400K will come from direct research.

Personnel Savings to be Bought Back.

All savings mentioned above are final savings and adjust for "buy backs" and new hires. In conducting a RIF, AFRRI's goal is to save $1.3 million. However, in the Corporate Technology taxonomy, AFRRI will realign the research teams and "buy back" approximately $400K of the $800K it plans to cut. In considering the closure of AFRRI's machine shop, the Institute will have to buy back a large portion of the work conducted. While currently being scrutinized, we are uncertain if it is even cost effective, so it is not yet included in the plan. Other reduction actions that may require outsource contracting include acquisition management and financial management. While it has been determined to move acquisition under our higher headquarters, AFRRI projects needing a workforce of two instead of three. AFRRI will have to "buy back" approximately 70% of the savings. In financial management, AFRRI will reduce its workforce to one civilian and one military comptroller. The savings, however, will not likely require a RIF action but will come from attrition.

Process for Streamlining.

a. Consolidation. AFRRI has achieved consolidation of its space and reduced its infrastructure significantly. Under current configuration, AFRRI will be cost-sharing over 18% of its facility (square footage) into the next century by hosting tenant units from such organizations as the Naval Medical Research Institute (NMRI), the Uniformed Services University of the Health Sciences, and the National Institute of Health. This alone is projected to generate cost reimbursements approaching $1 million per annum by the year 2001.

b. Outsourcing. AFRRI will continue to outsource whenever it is cost effective. Current examples include maintenance contracts for instrumentation support on an as needed basis, heating, ventilation and air conditioning (HVAC) support, and other facility support where contracts have taken the place of permanent hires.

c. Cross-Servicing. AFRRI currently utilizes its Veterinary Department and its Radiation Sources Department to support research interests of external agencies such as Walter Reed Army Medical Center, NMRI, the University of Maryland and others on a cost-reimbursable basis. The Institute actively seeks more extensive leveraging of these resources to realize even greater returns for offsetting operating expenses.

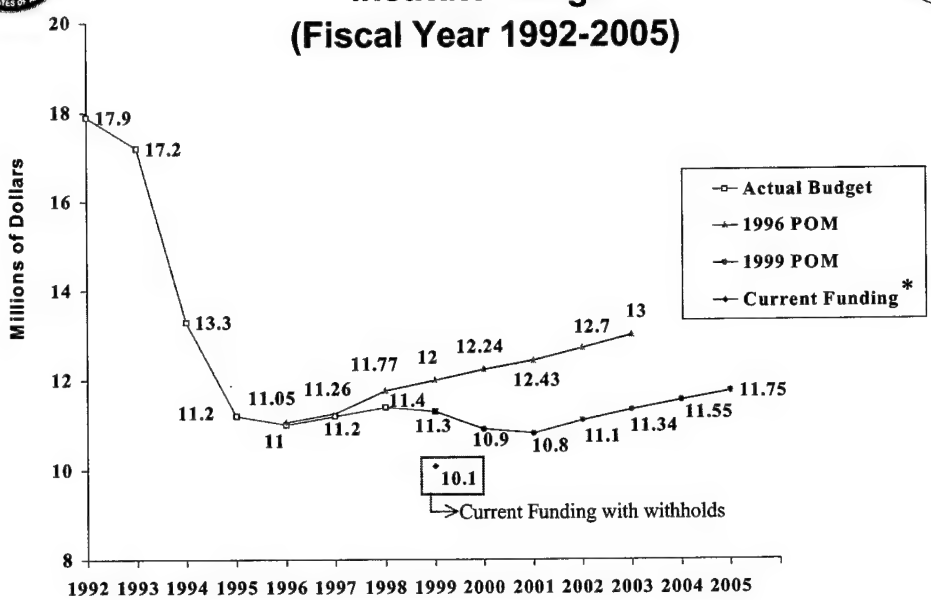
ROBERT R. ENG
COL, MS, USA
Director

Attachments:
1. AFRRI Minimum RDT&E Infrastructure
2. AFRRI Budget 1992-2005

Armed Forces Radiobiology Research Institute
Minimum RDT&E Infrastructure

Infrastructure Costs	1996 Cost	Projected 2001 Total Cost	Projected Cost Sharing	AFRRI Cost in 2001	Projected Savings (Loss)	Percent Saved (Lost)
Utilities	$1,085,078.00	$1,334,178.00	$237,457.00	$1,096,721.00	($11,643.00)	-1.1%
Telephone	$254,400.00	$270,000.00	$6,600.00	$263,400.00	($9,000.00)	-3.5%
Hazardous Waste	$18,710.00	$12,000.00	$2,135.76	$9,864.24	$8,845.76	47.3%
Trash Compactor	$52,884.00	$50,000.00	$8,899.00	$41,101.00	$11,783.00	22.3%
Custodial Service	$222,554.00	$150,000.00	$26,697.00	$123,303.00	$99,251.00	44.6%
Security	$276,000.00	$296,000.00	$52,682.08	$243,317.92	$32,682.08	11.8%
HVAC	$144,544.00	$70,000.00	$12,458.60	$57,541.40	$87,002.60	60.2%
DFAS	$132,557.00	$90,000.00	$0.00	$90,000.00	$42,557.00	32.1%
Learning Resource Center	$83,000.00	$85,000.00	$15,128.30	$69,871.70	$13,128.30	15.8%
Instrument Support	$253,588.00	$250,000.00	$0.00	$250,000.00	$3,588.00	1.4%
Support Salaries	$3,030,254.48	$3,348,851.01	$596,028.50	$2,752,822.51	$277,431.97	9.2%
Landscaping	$13,880.00	$15,000.00	$2,669.70	$12,330.30	$1,549.70	11.2%
Total	**$5,567,449.48**	**$5,971,029.01**	**$960,755.94**	**$5,010,273.07**	**$557,176.41**	**10.0%**

Armed Forces Radiobiology Research Institute Budget (Fiscal Year 1992-2005)



* Decrease from POM due to $1 million withhold by DDR&E and $200K by Washington Headquarters Service

Appendix J
Abbreviations and Acronyms

AEDC	Arnold Engineering Development Center
AEW	airborne early warning
AFB	Air Force Base
AFEWES	Air Force Electronic Warfare Evaluation Simulator
AFMC	Air Force Materiel Command
AFRRI	Armed Forces Radiobiology Research Institute
AMC	Army Materiel Command
ARI	Army Research Institute
B	billion
BMDO	Ballistic Missile Defense Organization
BoD	Board of Directors
BoOD	Board of Operating Directors
BoDES	Board of Directors Executive Secretary
BOS	Base Operations Support
BPR	business process re-engineering
BRAC	Base Realignment and Closure
C2	command and control
C2I	command, control, and intelligence
C4I	command, control, communications, computers, and intelligence
CBMT	Cost-Based Management Tool
CE	Corps of Engineers
CINC	commander-in-chief
DDDR&E	Deputy Director, Defense Research and Engineering
DEPSECDEF	Deputy Secretary of Defense
DFAS	Defense Finance and Accounting Service
DISA	Defense Information Systems Agency
DLA	Defense Logistics Agency

DMR	Defense Management Review
DMRD	Defense Management Report Decision
DoD	Department of Defense
DOE	Department of Energy
DOT&E	Director of Operational Test and Evaluation
DSB	Defense Science Board
DTRA	Defense Threat Reduction Agency
DTSE&E	Director, Test, Systems Engineering, and Evaluation
DTTSG	Defense Test and Training Steering Group
EMTE	Electromagnetic Test Environment
ESC	Electronic Systems Center
EW	electronic warfare
FOA	Field Operating Agency
FY	fiscal year
FYDP	Future Years Defense Program
GOCO	Government Owned, Contractor Operated
GOCO+	Government Owned, Contractor Operated variant where the contractor is allowed to market unused capability to non-DoD markets
HE	high explosive
ICBM	intercontinental ballistic missile
IR	infrared
JITC	Joint Interoperability Test Command
JNTF	Joint National Test Facility
JPO	Joint Program Office
JTTRR	Joint Test and Training Range Roadmap
K	thousand
KMR	Kwajalein Missile Range
LM&TT	Laboratory Management and Technology Transition
M	million
MACOM	major command
MRMC	Medical Research and Material Command
MRTFB	Major Range and Test Facility Base

NAS	Naval Air Station
NAVAIR	Naval Air Systems Command
NAVFAC	Naval Facilities Command
NAVSEA	Naval Sea Systems Command
NAWC	Naval Air Warfare Center
NAWC-AD	Naval Air Warfare Center Aircraft Division
NAWC-WD	Naval Air Warfare Center Weapons Division
NDAA	National Defense Authorization Act
NDIA	National Defense Industrial Association
NWCF	Navy Working Capital Fund
NWE	nuclear weapons effects
O&M	Operations and Maintenance
ONR	Office of Naval Research
OPTEC	Operational Test and Evaluation Command
OSD	Office of the Secretary of Defense
OTA	operational test agency
OTD	Office of the Test Director
PGW	precision-guided weapons
PGWCM	Precision Guided Weapons Countermeasures
POM	Program Objective Memorandum
PPBS	Planning, Programming, and Budgeting System
RCS	radar cross section
RDT&E	Research, Development, Test and Evaluation
REDCAP	Real-Time Electromagnetic Digitally Controlled Analyzer and Processor
S&T	Science and Technology
SECDEF	Secretary of Defense
SMDC	Space and Missile Defense Command
SPAWAR	Space and Naval Warfare Systems Command
SSG	Senior Steering Group
STOL	short take-off and landing
T&E	Test and Evaluation

TECOM	Test and Evaluation Command
USD(A&T)	Under Secretary of Defense (Acquisition and Technology)
V/STOL	vertical/short takeoff and landing
WBS	work breakdown structure
WMD	weapons of mass destruction
WY	work year